DISSERTATION ON

"A RANDOMISED COMPARATIVE STUDY BETWEEN KING VISION VIDEO LARYNGOSCOPE AND CONVENTIONAL DIRECT MACINTOSH LARYNGOSCOPE FOR NASOTRACHEAL INTUBATION."

Submitted to the

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY

In partial fulfilment of the requirements

For the award of degree of

M.D. (Branch-X)

ANAESTHESIOLOGY

GOVERNMENT STANLEY MEDICAL COLLEGE & HOSPITAL

THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY, CHENNAI, TAMILNADU

MAY – 2018

BONAFIDE CERTIFICATE

This is to certify that "**A Randomised Comparative Study between King vision video Laryngoscope and conventional Direct Macintosh Laryngoscope for Nasotracheal intubation.,**is a bonafide work done by**Dr.NOORAIN ANEEZ** Post graduate student, Department of Anaesthesiology at Government Stanley Medical College and Hospital, Chennai, under my guidance andsupervision in partial fulfillment of rules and regulations of the TamilNadu Dr. M.G.R Medical University, for the award of M.D. DegreeBranch X (Anaesthesiology) during the academic period from MAY 2015 To MAY 2018.

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DECLARATION

I, **Dr.NOORAIN ANEEZ**, solemnly declare that the dissertation, titled**A Randomised Comparative Study between King vision video Laryngoscope and conventional Direct Macintosh Laryngoscope for Nasotracheal intubation.,**is a bonafide work done by me during the period of JANUARY 2017 to SEPTEMBER 2017 at Government Stanley Medical College and Hospital, Chennai under the expert guidance of**Prof Dr.KUMUDHA LINGARAJ, M.D**, **D.A**, Professor and Head, Department Of Anaesthesiology, Government Stanley Medical College, Chennai.

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This is to certify that the dissertation titled***, A Randomised Comparative Study between King vision video Laryngoscope and conventional Direct Macintosh Laryngoscope for Nasotrachealintubation*** is a genuine work done by **Dr. NOORAIN ANEEZ** for the partial fulfilment of the requirements for M.D. (Anaesthesiology) Examination of The Tamilnadu Dr. M.G.R. Medical University to be held in April 2017, under my supervision and guidance.

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This is to certify that the dissertation "***A Randomised Comparative Study between King vision video Laryngoscope and conventional Direct Macintosh Laryngoscope for Nasotracheal intubation.***"presented herein by **Dr. NOORAIN ANEEZ** is an original work done in the Department of Anaesthesiology, Government Stanley Medical College and Hospital, Chennai in partial fulfilment of regulations of the Tamilnadu Dr. M.G.R. Medical University for the award of degree of M.D. (Anaesthesiology) Branch X, under the supervision and guidance of Prof Dr. KUMUDHA LINGARAJ, M.D, D.A., during the academic period 2015-20178

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This is to certify that the dissertation ***A Randomised Comparative Study between King vision video Laryngoscope and conventional Direct Macintosh Laryngoscope for Nasotracheal intubation***, presented herein by **Dr. NOORAIN ANEEZ** is an original work done in the Department of Anaesthesiology, Government Stanley Medical College and Hospital, Chennai in partial fulfilment of regulations of the Tamilnadu Dr. M.G.R. Medical University for the award of degree of M.D. (Anaesthesiology) Branch X, under my supervision during the academic period 2015-2018.

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INSTITUTIONAL ETHICAL COMMITTEE,
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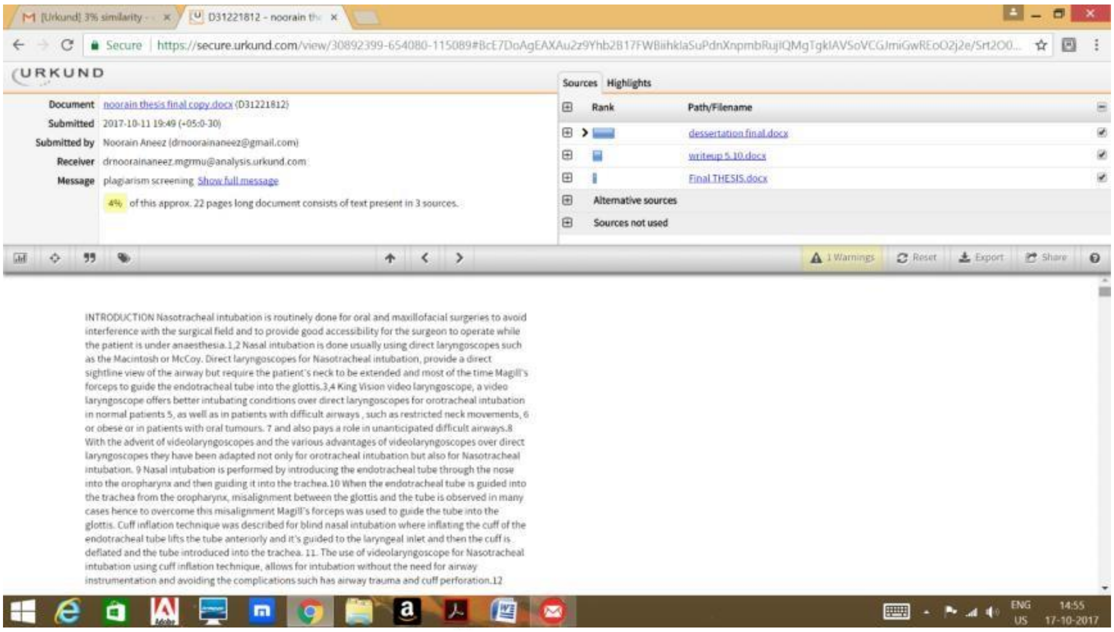

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INTRODUCTION Nasotracheal intubation is routinely done for oral and maxillofacial surgeries to avoid interference with the surgical field and to provide good accessibility for the surgeon to operate while the patient is under anaesthesia.1,2 Nasal intubation is done usually using direct laryngoscopes such as the Macintosh or McCoy. Direct laryngoscopes for Nasotracheal intubation, provide a direct sightline view of the airway but require the patient's neck to be extended and most of the time Magill's forceps to guide the endotracheal tube into the glottis.3,4 King Vision video laryngoscope, a video laryngoscope offers better intubating conditions over direct laryngoscopes for orotracheal intubation in normal patients 5, as well as in patients with difficult airways , such as restricted neck movements, 6 or obese or in patients with oral tumours. 7 and also pays a role in unanticipated difficult airways.8 With the advent of videolaryngoscopes and the various advantages of videolaryngoscopes over direct laryngoscopes they have been adapted not only for orotracheal intubation but also for Nasotracheal intubation. 9 Nasal intubation is performed by introducing the endotracheal tube through the nose into the oropharynx and then guiding it into the trachea.10 When the endotracheal tube is guided into the trachea from the oropharynx, misalignment between the glottis and the tube is observed in many cases hence to overcome this misalignment Magill's forceps was used to guide the tube into the glottis. Cuff inflation technique was described for blind nasal intubation where inflating the cuff of the endotracheal tube lifts the tube anteriorly and it's guided to the laryngeal inlet and then the cuff is deflated and the tube introduced into the trachea. 11. The use of videolaryngoscope for Nasotracheal intubation using cuff inflation technique, allows for intubation without the need for airway instrumentation and avoiding the complications such has airway trauma and cuff perforation.12
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LIST OF CONTENTS

INTRODUCTION

Nasotracheal intubation is routinely done for oral and maxillofacial surgeries to avoid interference with the surgical field and to provide good accessibility for the surgeon to operate while the patient is under anaesthesia.[1,2] Nasal intubation is done usually using direct laryngoscopes such as the Macintosh or McCoy. Direct laryngoscopes for Nasotracheal intubation, provide a direct sightline view of the airway but require the patient's neck to be extended and most of the time Magill's forceps to guide the endotracheal tube into the glottis.[3,4] King Vision video laryngoscope, a video laryngoscope offers better intubating conditions over direct laryngoscopes for orotracheal intubation in normal patients [5], as well as in patients with difficult airways , such as restricted neck movements, [6] or obese or in patients with oral tumours. [7] and also plays a role in unanticipated difficult airways.[8] With the advent of videolaryngoscopes and the various advantages of videolaryngoscopes over direct laryngoscopes they have been adapted not only for orotracheal intubation but also for Nasotracheal intubation. [9] Nasal intubation is performed by introducing the endotracheal tube through the nose into the oropharynx and then guiding it into the trachea.[10] When the endotracheal tube is guided into the trachea from the oropharynx, misalignment between the glottis and the tube is observed in many cases hence to overcome this misalignment Magill's forceps was used to guide the tube into the glottis. Cuff inflation technique was described for blind nasal intubation where inflating the cuff of the endotracheal tube lifts the tube anteriorly and its guided to the laryngeal inlet and then the cuff is deflated and the tube introduced into the trachea. [11]. The use of videolaryngoscope for Nasotracheal intubation using cuff inflation technique, allows for intubation without the need for airway instrumentation and avoiding the complications such has airway trauma and cuff perforation.[12]

AIMS AND OBJECTIVES

To compare intubation difficulty score, hemodynamic stress response , successful placement of endotracheal tube and complication between Macintosh laryngoscope and King Vision laryngoscope during nasotracheal intubation.

PRIMARY OBJECTIVES

TO COMPARE

- INTUBATION DIFFICULTY SCORE
- INTUBATION STRESS RESPONSE
- SUCCESSFUL PLACEMENT OF NASOTRACHEAL TUBE
- COMPLICATION

SECONDARY OBJECTIVES

TO COMPARE

- MODIFIED CORMACK LEHANE GRADING
- TIME TAKEN FOR LARYNGOSCOPY
- TIME TAKEN FOR INTUBATION

REVIEW OF LITERATURE

HISTORY

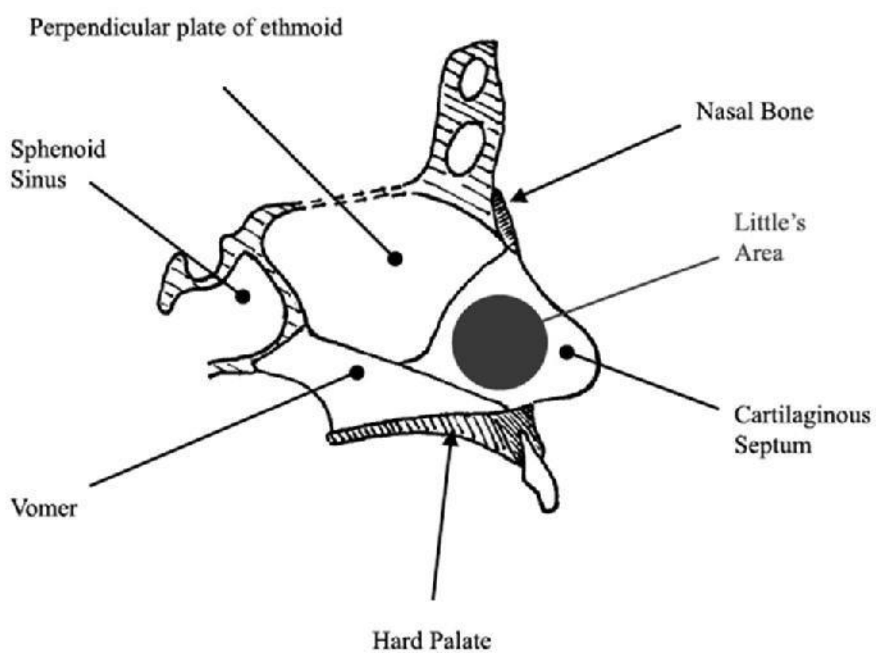
Nasal intubation technique was first described by Kuhn in 1902.[13] Macewen,[14,15] described intubation through natural passages like mouth or nose instead of performing a laryngotomy or tracheostomy. Meltzer and Auer,[16] Rosenberg, and Elsberg[17,18] were among the others pioneering the nasal intubation technique. In 1920, Rowbotham and Magill practiced and developed the technique of "blind" Nasotracheal intubation and coined the term.[19] Sir Ivan whiteside Magill then further popularised this technique in 1920s. Magill also described an angulated forceps to aid in intubation which was later named after him.[4] Gorback MS in 1987 described the technique of cuff inflation for blind Nasotracheal intubation [11]. . In 1998 Van Elstraete published various articles on the usefulness of cuff inflation technique in Nasotracheal intubation in difficult airway cases. [20]

NASAL ANATOMY

The nose is divided anatomically into the external nose and the nasal cavity.

The *cavity of the nose* is divided by the nasal septum into two compartments that open to the exterior through the *nares* and posteriorly into the nasopharynx through the posterior nasal apertures or otherwise called as choanae. Immediately within the nares a small dilatation is present called the vestibule, which on its lower part is lined by stiff straight hairs. Each side of the nose consists of roof, floor, medial and lateral wall. The *roof* slopes upwards and backwards which forms the bridge of the nose (the frontal and nasal bones), then continues to have a horizontal part which is the cribriform plate of the ethmoid bone, and then finally slopes downwards (composed of the sphenoid body).The *floor* is concave in shape from side to side and slightly concave so from before backwards. The floor is composed of the maxilla, the palatine process and of the palatine bone, the horizontal plate.

Figure 1: showing medial wall of the nasal cavity (nasal septum).

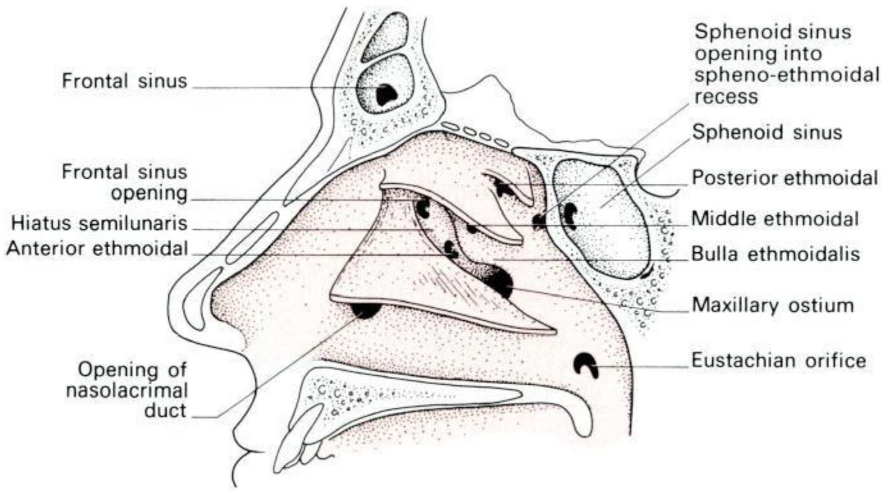


The nasal septum forms the *medial wall* (Fig.1).The nasal septum is formed by the septal cartilage, vomer and the perpendicular plate of ethmoid bone.

The *lateral wall* (Fig.2) consists of a bony framework made up of three bones Above, the nasal portion of the ethmoidal labyrinth below and in front is formed by the nasal aspect of the maxilla and behind, the perpendicular plate of the palatine bone. The bony framework has three scrolls like projections from the lateral wall called the conchae (turbinate bones). Each conchae arching over a *meatus*. Upper and middle *conchae* are formed by the medial part of the ethmoid labyrinth and the inferior concha is completely a separate bone.

Into the lateral wall of the nose the orifices of the paranasal sinuses and the nasolacrimal duct open.

Figure 2: Lateral wall of the nose.



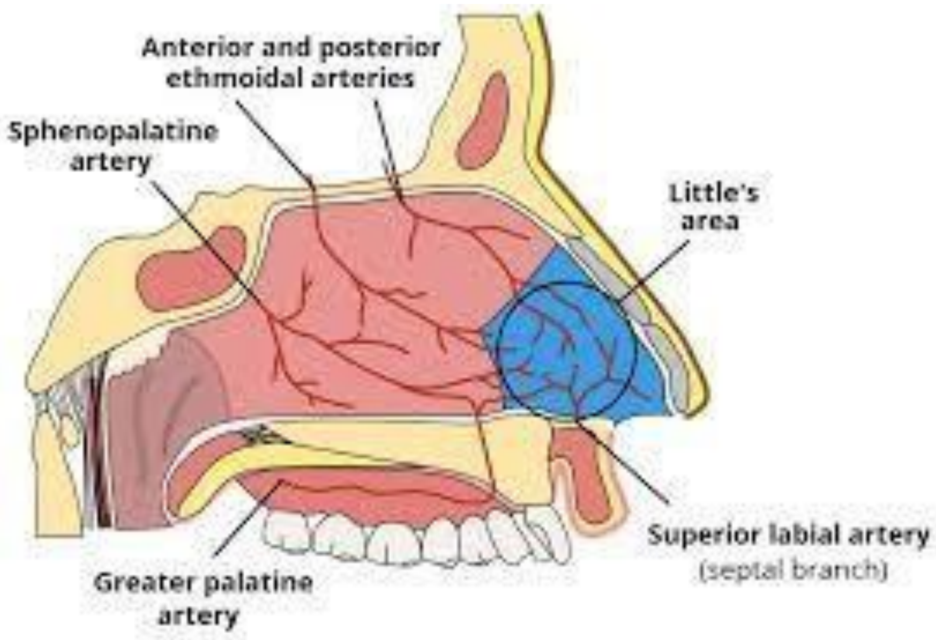
The sphenoid sinus opening drains into the *spheno-ethmoidal recess*, a depression in between the superior concha and the anterior surface of the sphenoid body. The posterior ethmoidal cells open into the superior meatus.

The middle ethmoidal cells project into the middle meatus to form an elevated bulge termed the *bulla ethmoidalis*, into which they open. There is a cleft below the Bulla, the *hiatus semilunaris*, into which the maxillary Sinus ostium opens. The hiatus semilunaris curves in front of the bulla ethmoidalis to form a passage termed the *infundibulum*, into which drains the anterior ethmoidal air cells. In about 50% of cases the frontal sinus opens superiorly into the infundibulum. The anterior cranial fossa is divided from the nasal cavity by the cribriform plate of ethmoid bone which is joined by the lateral wall and the septum of the nose. The entire nasal cavity is lined by pseudo stratified columnar epithelium and highly vascular mucosal stroma. They trap the particulate matter in the inspired air and provide humidification and protection of inspired air.

Blood supply of the nose (Fig.3)

The upper portion of the nasal cavity is supplied by the anterior and posterior ethmoidal branches, coming from the ophthalmic artery, which is a branch of the internal carotid artery. The sphenopalatine branch of the maxillary artery is distributed to the lower part of the cavity and links up with the septal branch of the superior labial branch of the facial artery on the anteroinferior part of the septum. It is from this zone, just within the vestibule of the nose, that epistaxis occurs in some 90% of cases (Little's area). A rich submucous venous plexus drains into the sphenopalatine, facial and ophthalmic veins, and through the last links up with the cavernous sinus. Small tributaries also pass through the cribriform plate to veins on the under surface of the orbital lobe of the brain. These connections account for the potential danger of boils and other infections within and adjacent to the nose.

Figure 3 : Blood supply of the nose



Nerve supply of the nose (Fig.4)

The olfactory nerve (I) supplies the specialized olfactory zone of the nose, which occupies an area in the uppermost parts of the septum and lateral walls of the nasal cavity. The nerves of common sensation are derived from the nasociliary branch of the 1st division of the trigeminal nerve (V) and also from the 2nd, or maxillary division (V).

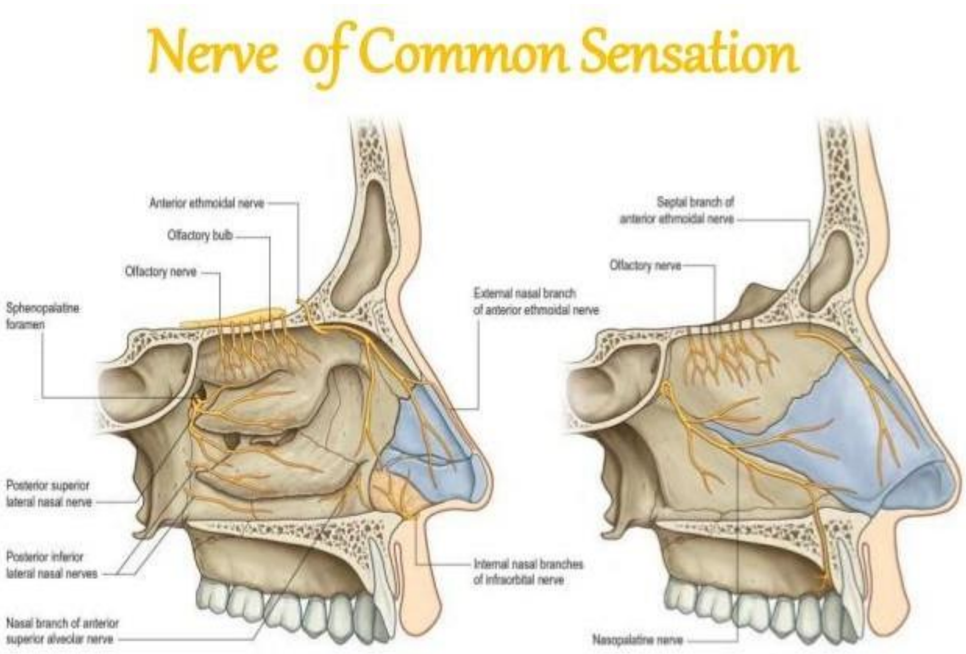
1 The *septum* is supplied, in the main, by the nasopalatine nerve, derived from trigeminal nerve via the pterygopalatine ganglion. The posterosuperior corner receives branches of the medial posterosuperior nasal nerves from the same source, and the anterior part of the septum is supplied by the septal branches of the anterior ethmoidal nerve (a branch of the nasociliary branch of trigeminal nerve).

2 The *lateral wall* is innervated in its upper part, in the region of the superior and middle conchae, by the lateral posterior superior nasal nerve. The inferior concha receives branches from the anterior superior alveolar nerve and from the anterior (greater) palatine nerve. The anterior part of the lateral wall, in front of the conchae, is supplied by the anterior ethmoidal branch of the nasociliary nerve.

3 The *floor* is supplied in its anterior part by the anterosuperior alveolar nerve and posteriorly by the anterior (greater) palatine nerve.

4 The *vestibule* receives terminal twigs of the infra-orbital branch of the maxillary nerve, which also supplies the skin immediately lateral to, and beneath, the nose.

Figure 4: Nerve supply of the nose.



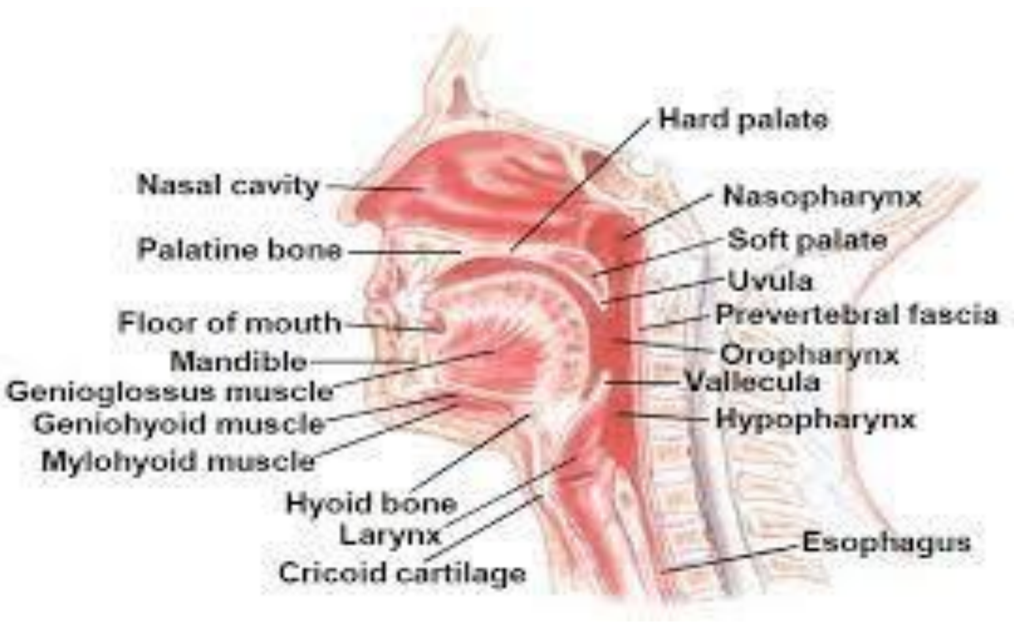
THE FUNCTIONS OF THE NOSE

The nose acts as a respiratory pathway, through which air becomes warmed, humidified and filtered, as the organ of olfaction and as a resonator in speech. There is a strong inborn reflex to breathe through the nose. As a result, nasal obstruction may cause gross discomfort; thus, packing the nose after surgery may cause restlessness upon emergence from an anaesthetic, and choanal atresia may cause cyanosis in the newborn. The natural expiratory resistance of the upper airway is of the order of 1–2 cmH2O and can be increased subconsciously to provide a natural form of continuous positive airway pressure. Intubation of the trachea decreases this natural expiratory resistance. Air passes through the nose, not directly along the inferior meatus, but in a curve through the upper reaches of the nasal cavity. The vascular cavernous plexuses, arranged longitudinally like so many radiator pipes, increase the temperature of the air to that of the body by the time it reaches the nasopharynx. Water, derived partly from the mucous and serous glands, partly from the goblet cells, but mainly by exudation from the mucous surfaces, produces nearly 100% saturation of the inhaled air. Filtration is effected by the blanket of mucus covering the nasal cavity and its related sinuses. The mucus is swept towards the pharynx like a sticky conveyor belt by the action of the cilia and then swallowed. Reflex sneezing also helps rid the nose of irritants. The blood supply to the nasal mucosa is under reflex control.

THE PHARYNX

The pharynx is a wide muscular tube that forms the common upper pathway of the respiratory and alimentary tracts. Anteriorly, it is in free communication with the nasal cavity, the mouth and the larynx, which is divided into three parts, termed the nasopharynx, oropharynx and laryngopharynx, respectively. In extent, it reaches from the skull (the basilar part of the occipital bone) to the origin of the oesophagus at the level of the 6th cervical vertebra (C6) (Fig.5). Posteriorly, it rests against the cervical vertebrae and the prevertebral fascia.

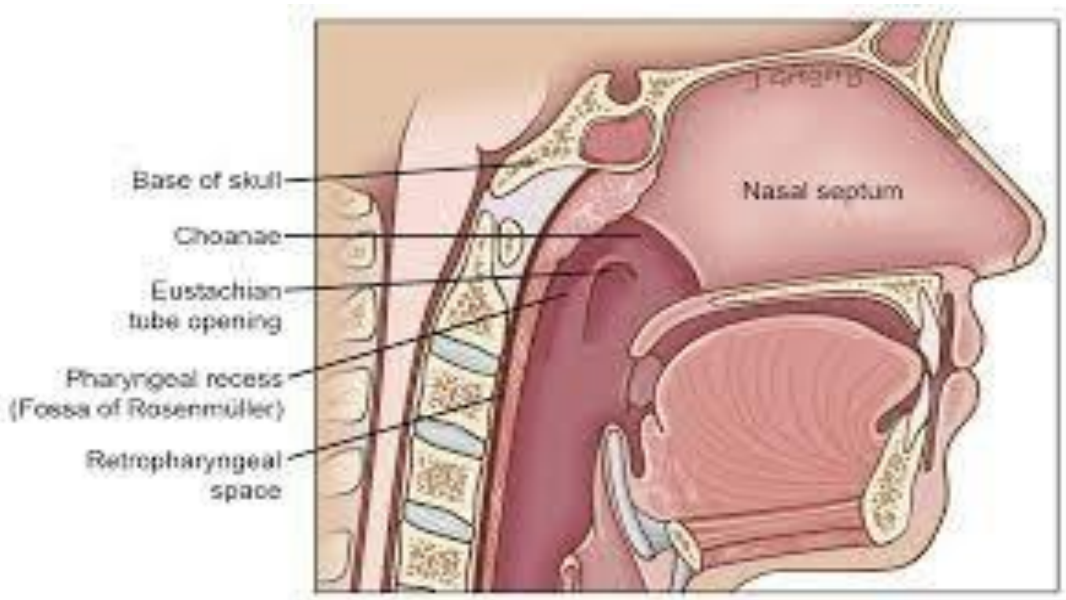
Figure 5 : Pharynx



THE NASOPHARYNX

The nasopharynx lies behind the nasal cavity and above the soft palate. It communicates with the oropharynx through the pharyngeal isthmus, which becomes closed off during the act of swallowing. On the lateral wall of the nasopharynx, 1 cm behind and just below the inferior nasal concha, lies the pharyngeal opening of the *pharyngotympanic* (*Eustachian*) *tube* (fig.6). The underlying cartilage of the tube produces a bulge immediately behind its opening, termed the *tubal elevation*, and behind this, in turn, is a small depression, the *pharyngeal recess* – fossa of Rosenmuller.

Figure 6: Nasopharynx

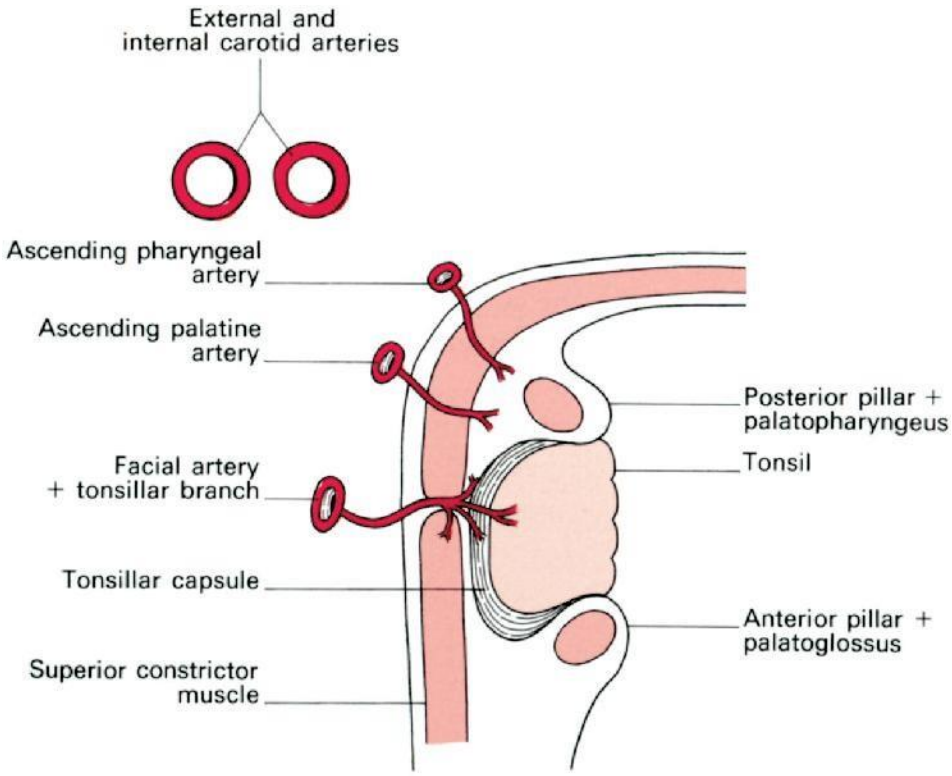


The *nasopharyngeal tonsil* (adenoids) lies on the roof and the posterior wall of the nasopharynx. It consists of a collection of lymphoid tissue covered by ciliated epithelium and lies directly against the superior constrictor muscle; it has no well-defined fibrous capsule. The lymphoid tissue begins to atrophy at puberty and has all but disappeared by early adult life. Posterosuperiorly to the nasopharynx lies the sphenoid sinus that separates the pharynx from the sella turcica containing the pituitary gland. This is the basis of the transnasal approach to the pituitary.

THE OROPHARYNX

The mouth cavity leads into the oropharynx through the oropharyngeal isthmus, which is bounded by the palatoglossal arches, the soft palate and the dorsum of the tongue. The oropharynx itself extends in height from the soft palate to the tip of the epiglottis. Its most important feature is the tonsils.

Figure 7: Oropharynx showing the palatine tonsil.



The *palatine tonsils (fig.7)* are the collections of lymphoid tissue that lie on each side in the triangle formed by the palatoglossal and palatopharyngeal arches (the pillars of the fauces), connected across the base by the dorsum of the tongue. The free surface of each palatine tonsil presents about 12–20 tonsillar pits, and its upper part bears the intratonsillar cleft. This free surface is covered by a stratified squamous epithelium: the unique combination of squamous epithelium with underlying lymphoid tissue renders a section through the tonsil unmistakable under the microscope. The deep surface of the palatine tonsil may send processes of lymphoid tissue into the dorsum of the tongue, into the soft palate and into the faucal pillars. The palatine tonsil is bounded on this deep aspect by a dense fibrous *capsule* of thickened pharyngeal aponeurosis, which is separated by a film of lax connective tissue from the underlying superior constrictor muscle. In the absence of inflammation, this capsule enables complete enucleation of the tonsil to be effected. However, after repeated quinsies, the capsule becomes adherent to the underlying muscle and tonsillectomy then requires sharp dissection.

VASCULAR, LYMPHATIC AND NERVE SUPPLY

The principal blood supply of the palatine tonsil is the tonsillar branch of the facial artery which, accompanied by its two venae comitantes, pierces the superior constrictor muscle to enter the inferior pole of the tonsil. In addition, twigs from the lingual, ascending palatine, ascending pharyngeal and maxillary arteries all add their contributions. Venous drainage passes into the venae comitantes of the tonsillar branch of the facial artery and also into a paratonsillar vein that descends from the soft palate across the outer aspect of the tonsillar capsule to pierce the pharyngeal wall into the pharyngeal venous plexus. It is this vein which is the cause of occasional unpleasant venous bleeding after tonsillectomy. The internal carotid artery, it should be noted, is a precious 2.5 cm away from the tonsillar capsule, and is out of harm's way during tonsillectomy.

Lymph drainage is to the upper deep cervical nodes, particularly to the jugulo-digastric node (or tonsillar node) at the point where the common facial vein joins the internal jugular vein.

There is a threefold sensory nerve supply:

1 the glossopharyngeal nerve via the pharyngeal plexus;

2 the posterior palatine branch of the maxillary nerve;

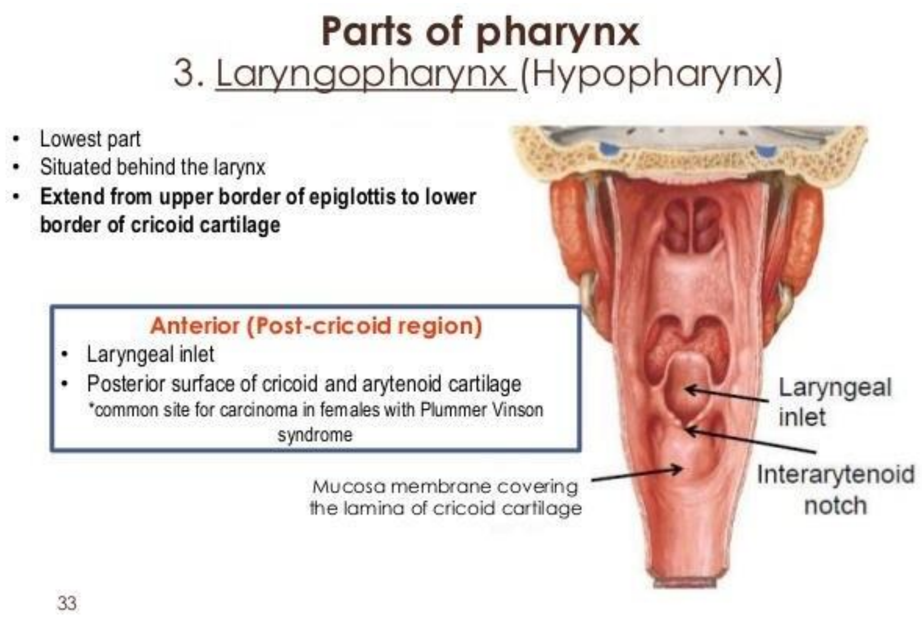
3 twigs from the lingual branch of the mandibular nerve.

For this reason, infiltration anaesthesia of the tonsil is more practicable than attempts at nerve blockade. The palatine and pharyngeal tonsils, together with lymph collections on the posterior part of the tongue and in relation to the Eustachian orifice, form a more or less continuous ring of lymphoid tissue around the pharyngeal entrance, which is termed Waldeyer's ring.

THE LARYNGOPHARYNX

The third part of the pharynx extends from the tip of the epiglottis to the lower border of the cricoid at the level of C6 (Fig.8). Its anterior aspect faces first the laryngeal inlet, bounded by the aryepiglottic folds, then, below this, the posterior aspects of the arytenoids, and finally the cricoids cartilage. The larynx bulges back into the centre of the laryngopharynx, leaving a recess on either side termed the *piriform fossa*. It is here that swallowed sharp foreign bodies such as fish bones tend to impact. The internal branch of the superior laryngeal nerve passes in the submucosa of the piriform fossa.

Figure 8: Laryngopharynx

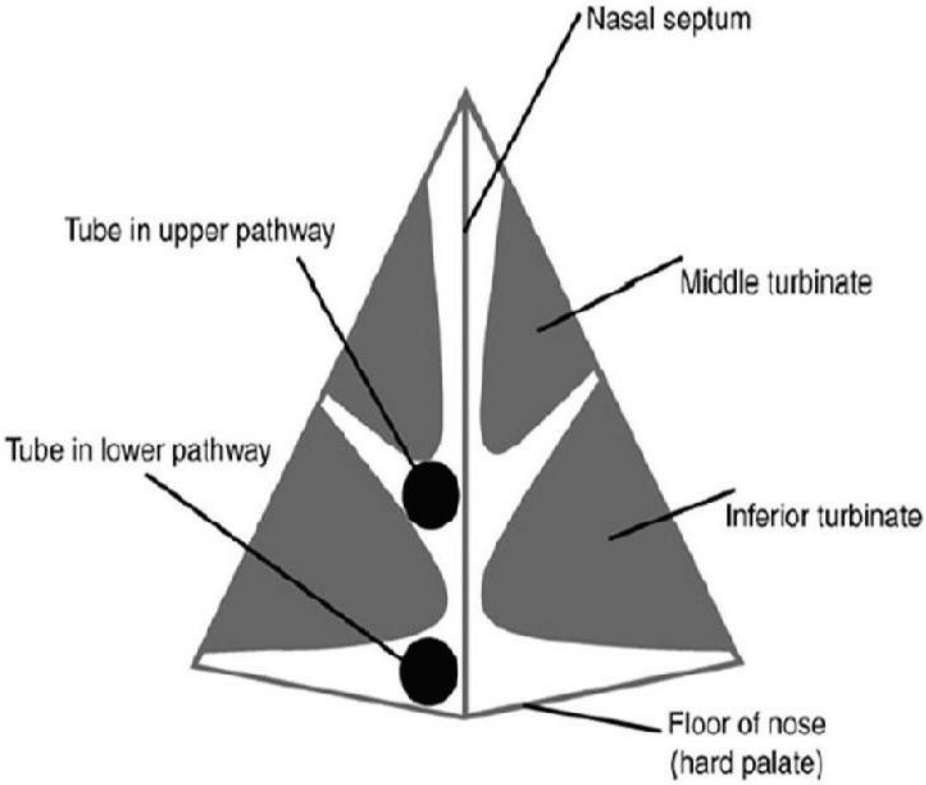


ANATOMICAL ANOMALIES

Deviations of the nasal septum are very common; in fact, they are present to some degree in about 75% of the adult population. Probably nearly all are traumatic in origin, and result from minor injuries in childhood or even at birth.

Males are more commonly affected than females. Both nostrils may become blocked, either from a sigmoid deformity of the cartilage or from compensatory hypertrophy of the conchae on the opposite side. The deviation is nearly always confined to the anterior part of the septum. Anatomical changes in the nasal cavity cause differences in the airflow dynamics within the nasal cavity which leads to further changes in mucosal lining. The convex side of the deviated nasal septum there is an occurrence of ulcerations and drying, henceforth on the concave side of the deviated nasal septum compensatory inferior turbinate hypertrophy occurs, which may further lead to an overall narrowing of the upper airway. Severe trauma or surgery leads to severe forms of narrowing of the nasal cavity. There are two essential anatomical pathways (Fig.9) through which the endotracheal tube (ETT) passes as it is guided through the nasal cavity. One pathway which lies along the floor of the nasal cavity, the lower pathway and the other pathway which lies just below the middle turbinate, upper pathway both are divided by the inferior turbinate. Once the tubes path is established in the nose, it is quite difficult to change the path because the medial border of the inferior turbinate is close to the nasal septum. The middle turbinate is attached by the cribriform plate to the base of the cranium and it has high vascularity. Any trauma which leads to avulsion or injury of the middle turbinate has the potential to lead to severe epistaxis or cerebrospinal fluid rhinorrhea or olfactory nerve injury due to damage to the cribriform plate; this is more commonly seen in patients with pre-existing concha bullosa or middle turbinate hypertrophy. . The lower pathway for Nasotracheal intubation is safer by introducing the endotracheal tube caudally along the floor of the nasal cavity and away from the middle turbinate and cribriform plate to avoid injury to these structures

Figure 9: Showing pathways of tube passage during Nasotracheal intubation



CONVENTIONAL MACINTOSH LARYNGOSCOPE

Macintosh laryngoscope was first introduced in 1943 by Robert Reynolds Macintosh and was so named after him, Macintosh laryngoscope. Laryngoscopes are used to get a sightline view of the larynx and oral cavity, for the purpose of introducing a endotracheal tube into the tracheobronchial tree. Other uses of laryngoscopes include placing a gastric drainage tube or Trans oesophageal echocardiography probe to visualise the heart, to visualize and assess the upper airway and for foreign body removal in the airway.

Parts of laryngoscope are

1. Handle

2. Blade

Handle: The handle is the part of the laryngoscope that is held in the hand during use. It provides the power source for the light in the blade.

Disposable batteries are mostly used as the power source. Handles with rechargeable batteries are also available. Handle is designed to accept the blades that have a light bulb which have a metallic contact, where the electrical circuit is complete when the handle and blade are in contact. The use of fibreoptic illumination and the handles containing batteries have a halogen lamp bulb. An activator switch is depressed when the handle and the blade are in working position. Hence A connection would be provided between the batteries and the bulb. The life of halogen lamp bulb is longer than other light bulbs. This has proven through studies that the illumination in lamp in blade is far better than the fibreoptic systems.

Handles are available in various sizes. To improve grip a rough surface is provided. Short handles may be more useful in patients in whom the chest or breasts contact the handle when it is used, or when cricoid pressure is being given. To overcome this, another technique is to insert the blade laterally into the mouth and then to adjust it to midline position inside the mouth. The blade can be removed from the handle before it is inserted into the mouth and after insertion can be attached back to the handle.

Blade:

The blade is that part of the laryngoscope which is introduced into the mouth. There are various sizes of blades that are available, (fig.10) hence they are numbered with increasing number which denotes increasing sizes. The blade is composed of several parts including the base, tongue, heel, flange, tip, web and light source (fig.11).

Figure10: Macintosh Laryngoscope

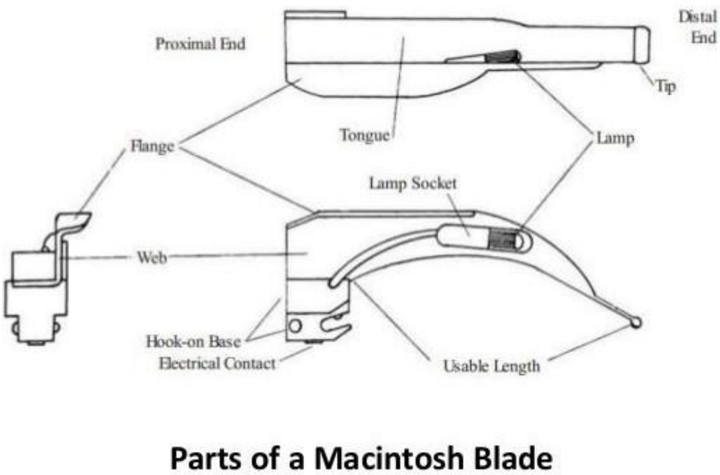


Figure11: Parts of Macintosh laryngoscope

The component of the blade that attaches to the handle is the **BASE**. The base has a slot provided for the hinge pin which engages with the handle. The end portion of the base is called the **Heel.**

Tongue or Spatula is the main shaft of the laryngoscope. It helps in compression and manipulation of soft tissues and lower jaw especially structures like the tongue. The long axis view of the tongue of the laryngoscope can be straight or curved, either in part or through the entire length. Blades of Macintosh Laryngoscope are curved in shape with regard to the shape of the tongue.

The connection between the handle and blade is mostly of the **Hook-on or hinged/ folding** type. The blade's base attaches into a slot on the handle through a hinge pin. This allows for the blade to be easily and quickly attached or removed from the handle.

The Flange is the part that **projects** off from the side of the tongue. It is connected to the tongue through the **Web.** The flange helps to deflect tissues that interfere in the line of vision of the operator and also helps to guide instrumentation.

The Tip or the beak is the end of the blade that is in contact with the epiglottis or vallecula. It directly or indirectly serves to elevate the epiglottis for glottis visualisation. The tip is kept blunt and thick to avoid trauma while performing laryngoscopy.

The light source is connected to a small bulb present in the blade. The light source is energised when the handle and blade are hinged on to operating position.

Lamp (bulb) transmits light from a source present in the handle. The lamp is screwed into a socket on the tongue that has metallic contact with the light source. When the blade is hinged on the handle into a working position, electrical contact is achieved with the power source present in the handle and the light source is energised leading to lighting of the bulb. The socket is exposed to soiling by secretions and fluids in the oral cavity that can produce inadequate electrical contacts, leading to the light to fail.

MAGILL'S FORCEPS

Forceps are used to direct a tracheal tube into the larynx or a gastric tube or other devices into the oesophagus. It may also be use to insert and remove pharyngeal packing and to remove foreign bodies from the upper airway or oesophagus. Magill's forceps are designed so that when the grasping ends are in the axis of the laryngeal tube, the handle is to the right.(fig12). The tracheal tube cuff may become damaged, especially when forceps are used with high volume, low pressure cuffs. the tube should not be grasped at the cuff. Another method to avoid cuff injury is to soothe the ridges on the forceps. The forceps may cause damage to the airway mucosa. Another problem is that one arm of the forceps may become lodged in the Murphy eye.

Figure 12: Magill's forceps

KING VISION VIDEOLARYNGOSCOPE

King vision consists of two parts

1. Stem

2. Blade.

Stem of the laryngoscope is reusable. It has a colour screen video display and battery housing. The Video Aspect Ratio is 4:3, the Video Refresh Rate is 30 frames per second and the Video Screen Size is 6.096 cm / 2.4" diagonal of the colour screen (fig.13).

Blade of the laryngoscope is disposable and for single use only. It has L-shaped blades. The shape of the blade is so designed that is easily conforms to the airway and thus avoiding the need to align axes and provides an around the corner 160 degrees view of the larynx. The illuminating source and video camera are present in the tip of the blade. The blades are available either channelled or non channelled (fig.14). The tube hooks into the guiding channel and provides a passage for the endotracheal tube to easily pass into the glottis maintaining the curvature all throughout. The non channelled blade has no guiding channel in and thus the tube needs to be aligned to the blade and to the glottis to achieve intubation. The battery life is about 90 minutes. The tip has an antifog coating to prevent fogging.

Figure13: Stem of King vision video laryngoscope

Figure 14: channelled and non channelled blade of King vision laryngoscope

JOURNAL REVIEW

1. **Swapnil M. Khadake** [25] et al compared safety and efficacy of cuff inflation technique using king vision video laryngoscope over conventional method of NTI using Magill's forceps. The Study was done in sixty patients for 1 year of including patients of age 18 to 65 years, ASA grade 1 / 2, MPC 1 to 4 with mouth opening ≥2 cm undergoing elective surgeries under general anaesthesia. They compared -Stress response (MBP, HR), airway injuries and SPO2. Nasotracheal intubation using Macintosh laryngoscope with Magill's forceps showed significant rise in stress response. While using Macintosh laryngoscope with Magill's forceps, Airway injuries were noted in 5 patients and ETT cuff injury was noted in 1 patient. No airway injuries or ETT cuff perforation noted with King Vision Videolaryngoscope using cuff inflation .No patient of either group went in for hypoxia. They concluded that Cuff inflation technique using King Vision videolaryngoscope reduced stress response and airway injuries due to Macintosh laryngoscope and Magill forceps. It can also increase success rates of difficult NTI.

2. **N. Gupta et al** [26] compared the efficacy of GlideScope video laryngoscope aided Nasotracheal intubation using cuff-inflation technique in head and neck cancer patients. The study was performed in 5 patients with head and neck cancer with mouth opening more than 1.8cm. A

100% success rate for Nasotracheal intubation in all five patients at the first attempt was noted. The time taken for intubation ranged from 35 to 60 s. In two patients, after inflating the tracheal tube with air the tube could be guided through the glottis but could not be introduced further into the trachea after deflating the cuff. In these two patients, with a 180° rotation of the tube intubation was successful. Oxygen saturation was more than 95% throughout in all patients. There was no episode of airway trauma or bleeding during intubation of any of the patients. GlideScope video laryngoscope assisted Nasal intubation using the cuff inflation technique can be considered as an alternative to blind cuff inflation technique or NTI using fibreoptic bronchoscope in patients with head and neck cancers.

3. **Vinuta V Patil et al** [27] compared intubating conditions between Macintosh direct laryngoscope and C MAC® VL for NTI. Study included Sixty ASA Physical Status I, II patients, aged 8–18 years, undergoing tonsillectomy surgery under general anaesthesia with NTI were randomised into two groups of thirty each. Patients in group 1 were intubated Nasotracheally using Macintosh direct laryngoscope and group 2 with CMAC® Videolaryngoscope. Cormack Lehane grading, need for additional manoeuvres time required for intubation, and hemodynamic stress response changes during and after intubation were compared

between the two groups. CL grade 1 views were obtained in 26/30 patients in group 1 and 29/30 patients in group 2, respectively (86.7% vs. 96.7%). 4 patients in groupn1 and 1 patient in group 2 were having CL grade 2 (13.3% vs. 3.3%). Intubation time was significantly less in group 2. The Need for additional manoeuvres (M1–M5) was noted more in group 1 (97% vs. 77%). M1 (external manipulation) was needed more in group 2. Magill's forceps (M4) and M4 with external manipulation (M5) were needed more in group 1. Group 2 patients NTI was more successful using cuff inflation alone (M2) or cuff inflation using external additional manipulation (M3) than group 2. The overall intubating conditions of CMAC® VL were better than direct Macintosh laryngoscope for NTI with respect to view of glottis, intubation time and the need for additional manoeuvres.

4. **Van Elstraete et al**[28] evaluated the efficacy of endotracheal tube cuff inflation technique as an aid to blind nasotracheal intubation. The study was performed in 20 ASA I and II patients undergoing elective oral surgery under general anaesthesia. NTI was performed in each patient once by inflating the tracheal tube cuff in the oropharynx and once by keeping the tracheal tube cuff deflated throughout the procedure. Intubation was successful in nine of 20 (45%) patients with keeping the cuff deflated and in eight of 20 (40%) in first attempt it was successful.

Intubation was successful in 19 of 20 patients (95%), while keeping the tracheal tube cuff inflated of which 15 of 20 (75%) were done in first attempt. Intubation time was not significantly different ($P > 0.05$). In patients with normal airway, endotracheal tube cuff inflation in the oropharynx increases the success rate of blind nasal intubation.

5. **Van Elstraete AC et al** [29] compared the efficacy of tracheal tube cuff inflation technique and Fibreoptic bronchoscope guided Nasotracheal intubation in patients with cervical spine injury. Twenty ASA physical status I and II patients undergoing elective surgery in which nasal intubation was to be performed were enrolled in the study. The cervical spine of each patient was immobilized. NTI was performed twice, once using fiberoptic bronchoscopy and once using the technique of bind intubation with ETT cuff inflation in the oropharynx. While using ETT cuff inflation technique a maximum of three attempts were allowed. A maximum of 3 min for NTI was allowed using fiberoptic bronchoscopy. Intubation was successful in 19 of 20 patients (95%) using both the techniques. The first attempt at intubation was successful in 14 of 20 patients (70%) while using ETT cuff inflation and 19 of 20 patients (95%) when using fiberoptic bronchoscopy. Mean intubation times were 20.8 +/- 23 s while using the ETT cuff inflation technique and 60.1 +/- 56 s when using fiberoptic laryngoscopy ($P < 0.01$). Both ETT cuff inflation

technique and fiberoptic bronchoscopy are equally efficient for nasotracheal intubation in patients with cervical spine injuries and that ETT cuff inflation technique can be used as an easy, cheap alternative to fiberoptic bronchoscopy in cervical injury patients.

6. **Shubhada R. Deshmukh et al**[30] studied the effect of endotracheal tube cuff inflation technique and head position in the success of blind Nasotracheal intubation. The study included 52 ASA I&II patients. After general anaesthesia was induced, blind nasal intubation was done in spontaneously breathing patients in the following sequence: 1) Head on bed with cuff deflated (HBCD); 2) Head on bed with cuff inflated (HBCI); 3) Head on pillow with cuff deflated (HPCD);4) Head on pillow with cuff inflated (HPCI). The other positions in the sequence were not tried once intubation is successful with one head position and state of endotracheal tube. If the patient could not be intubated with all the manoeuvres, direct laryngoscopy was done and patient was intubated orally. Blind nasal intubation was successful in 47 patients (90.38%) out of 52 in either one of the positions. BNTI was successful in 3(6.38%) patients in HBCD, 17(34.69%) patients in HBCI, 1(3.13%) patient in HPCD and 25(83.87%) patients in HPCI positions. The remaining 5 cases (9.62%) that could not be intubated by BNTI were intubated with direct laryngoscopy. The Success of BNTI was more significant along with the

tracheal tube cuff inflated, with either the head was on the table (z P=0.0015) or head was on the pillow (P=0.000006). Success of BNTI was significantly more with the head on pillow than with to head on bed.

7.**Rakesh Kumar et al e**[31] compared the role of cuff inflation technique in improving oropharyngeal navigation of three endotracheal tubes of varying stiffness during Nasotracheal intubation using direct laryngoscope. One hundred sixty-two adults were included and randomized to undergo Nasotracheal intubation with either a cuffed PVC (n = 54), cuffed wire reinforced (WR; n = 54) or cuffed silicone-tipped WR (SWR; n = 54) Endotracheal tubes. Ease of insertion was assessed of these tubes during passage from the nose into the oropharynx, from the oropharynx into the laryngeal inlet if required aided by cuff inflation, and from the laryngeal inlet into the trachea. A blind observer assessed the nasal morbidity. 100% success rate for NTI was noted with all the three tubes. 71 of 162 ET tubes were inserted from oropharynx into laryngeal inlet without the need for cuff inflation. 86 of the remaining 91 tubes could be inserted into the laryngeal inlet by cuff inflation technique in the oropharynx. A total of 157 ET tubes could be introduced into the laryngeal inlet with or without cuff inflation. The remaining 5 tubes were inserted into the laryngeal inlet with the aid of Magill forceps. The cuff inflation technique efficiently improved the intubation success of all the 3 ET tubes of varying stiffness during NTI with direct laryngoscope. While using the cuff inflation technique, the SWR ET tube seems performs better than the PVC and WR ET tubes in terms of nasotracheal navigability and decreased perioperative nasal injury.

8. **Manuel Ángel Gómez-Ríos** [32] et al compared the Airtraq® NT, McGrath® MAC and Macintosh laryngoscopes for NTI in a manikin with simulated easy and difficult airways. Sixty-three anaesthetists were enrolled in which each anaesthetist performed nasotracheal intubation with all three laryngoscopes, in a manikin with both easy and difficult airways. The primary objective was intubation time. Secondary objectives observed were laryngoscopic view, intubation success rate, number of additional manoeuvres, audible dental clicks and the force applied to the airway. Intubation time was significantly less with the McGrath MAC in both scenarios and with the Airtraq in the difficult airway scenario, when compared with Macintosh laryngoscope. Both videolaryngoscopes gave Cormack and Lehane grade 1 or 2 views more than the Macintosh laryngoscope in the difficult airway scenario ($p < 0.001$). The McGrath MAC videolaryngoscope had the most first-attempt success rate. The number of optimisation manoeuvres, presence of audible dental clicks and subjective evaluation of the degree of force applied to the upper airway were significantly less for indirect laryngoscopes compared to Macintosh laryngoscope ($p < 0.001$).

9. **Fu S. Xue, MD et al** [33] assessed the efficacy of cuff inflation technique as an aid to Nasotracheal intubation while using Airtraq videolaryngoscope. They enrolled 72 patients of ASA physical status I-

II, aged 18 to 51 yr, and were scheduled for elective maxillofacial and oral surgeries under general anaesthesia requiring NTI. Exclusion criteria were patients with a known or anticipated difficult airway and those with a history of nasal trauma and injuries and patients with recurrent epistaxis. The Portex cuffed endotracheal tubes with inner diameters of
7.0 and 6.5 mm for male and female patients, were used respectively. In 49 of the 72 patients NTI was successful at the first attempt without cuff inflation. In the remaining 23 patients, the nasotracheal tube tip was misaligned with the glottis during the first intubation attempt. 16 of the 23 misaligned tube tips were posterior tip positions and 7 were lateral tip position. By using the cuff inflation technique, the nasotracheal tube tip was directed successfully towards the glottis and NTI was successful. The volume of air required for cuff inflation was 12.5 ± 3.2 mL The time taken for intubation in patients without cuff inflation and with cuff inflation were 20.3 ± 6.8 sec and 27.5 ± 7.2 sec, respectively. From this study it was concluded that Cuff inflation technique is useful aid in improving success of Nasotracheal intubation with Airtraq videolaryngoscope

10. **Sherif M. Elhadi et al** [34]compared the efficacy of King vision laryngoscope with Macintosh laryngoscope for endotracheal intubation in routine airway management. The study included 100 patients in two

groups, Group M (50 patients) underwent general anaesthesia and were intubated using Macintosh laryngoscope, Group K (50 patients) underwent general anaesthesia and were intubated using King Vision laryngoscope. In The KVVL group they observed less hemodynamic response to laryngoscopy and intubation, improved Cormack and Lehane view of glottis, reduced requirement for optimization manoeuvres and reduced difficulty Likert scale score as compared with the Macintosh laryngoscope (ML) Group. There were no differences noted in intubation time, success rates and complications between both the devices.

11. **H.k Baddoo and B.J Phillips et al**[35] assessed the efficacy of cuff inflation as an aid to nasotracheal intubation using the C -MAC videolaryngoscope. The study was performed in 5 patients undergoing maxillofacial surgery with or without difficult airways under general anaesthesia. Nasotracheal intubation was successful in all 5 patients with C-MAC videolaryngoscope with cuff inflation as an aid to lift the tip of the tube off the posterior pharyngeal wall and guide the tube into the glottis. From this study it was concluded that C-MAC videolaryngoscope can be a useful tool for nasotracheal intubation with the aid of cuff inflation technique.

12. **Akihisa Y et al** [36] in this study, observed the efficacy of King Vision laryngoscope in novice personnel. Thirty one registered nurses were included in this study. In a randomized fashion, intubation was done with either Macintosh laryngoscope, King Vision laryngoscope with channelled blade or with non channelled blade. It was noted that the mean intubation time was less with Macintosh blade than by intubation with King Vision channelled blade. The King vision non channelled blade in comparison with the Macintosh blade or the King vision channelled blade required significantly more time for intubation. Success rate with the King vision non channelled blade was significantly less compared to that with the Macintosh blade or King Vision channelled blade. Median intubation difficulty score was lesser with both Macintosh blade and King Vision channelled blade in comparison with King Vision non channelled blade. No oesophageal intubation occurred with King Vision channelled blade. However, intubation times and success rates were similar to the values obtained with the Macintosh blade. The study thus concluded that King vision Video laryngoscope with channelled blade could be used efficiently as an alternative to Macintosh laryngoscope for intubation by novice personnel.

MATERIALS AND METHODS

Eighty patients of ASA physical status one and two undergoing elective Surgeries under general anaesthesia requiring Nasotracheal intubation were included in the study. It is a randomised prospective control study. Patients in the age group of 10 -60 years were included in the study. The study was conducted in Stanley medical college. The study was approved by our institutional ethical committee. After obtaining informed written consent from the patients or the parents of the patients the study was conducted. This study was done for a period of six months.

INCLUSION CRITERIA

Age: 10 – 50 yrs.

ASA I and ASA II

Surgery: Elective oral surgery requiring Nasotracheal intubation under general anaesthesia

Mallampatti score: one and two

Mouth opening more than 2 cm

EXCLUSION CRITERIA

Age less than 10 years and more than 60 years

Increased intracranial pressure

Cervical spine injury

Patients with past history of musculoskeletal disorders

Emergency surgery, those at increased risk of aspiration

Mouth opening less than 2 cm

ASA PS III or more

MATERIALS REQUIRED

Macintosh Laryngoscope blades of sizes 2, 3 and 4

King vision laryngoscope with non channelled blade

Drugs –

Inj. Glycopyrrolate

Inj. Midazolam

Inj. Fentanyl

Inj. Propofol

Inj. Vecuronium

Inj. Succinylcholine

Inj. Neostigmine and all emergency drugs

Endotracheal tubes of varying sizes

Monitors- ECG/ NIBP/ Pulse oximetry/ Capnography

2 ml, 5ml and 10 ml syringes

18 G IV cannula

IV fluids

SAMPLE SIZE AND RANDOMISATION

The sample size was estimated as 80 based on previous studies and pilot study

Sample size:

It is assumed the mean difference between the groups was 10 and the SD=17 are before the experiment and the effect of the instrument after the application on subjects. Assuming the significance level of 5% with power of 80% the required sample size for the study is 92.i.e. for each group 46 subjects is needed

The formula for the sample size calculation is as follows.

Where n = sample size required for each group=36

$Z\alpha$ = level of significance at 5%. =1.96

$Z\beta$ = power for detecting significance difference between the group 80% =0.842

m1 mean value for the group1

m2 mean value for the group2

m2-m1 = 10

S1 = standard deviation of group1 =15

S2 = standard deviation of group2= 15

Based on the formula (sample size of 36 is required in each group for significance) and previous literature, eighty patients have been enrolled in this study.

They were randomly allocated to 40 in each group and were named as Group ML (Nasotracheal intubation using direct Macintosh laryngoscope) Group KL (Nasotracheal intubation using King Vision video laryngoscope) Randomisation is done by computerized generated randomized table.

CONDUCT OF ANAESTHESIA

GROUPS

GROUP ML: Nasotracheal Intubation with Direct Macintosh laryngoscope using Magill's forceps.

GROUP KL: Nasotracheal Intubation with King vision video laryngoscope using cuff inflation technique.

MONITORING

A. NON INVASIVE BLOOD PRESSURE

B. HEART RATE

C. SPO2

D. ECG

E. ETCO2

METHODOLOGY

The consented patients of ASA I and ASA II of age 10-60 yrs of both genders scheduled for elective surgery requiring Nasotracheal intubation under general anaesthesia were selected.

PRE ANAESTHETIC PREPARATION

Patients were admitted in the ward as inpatients and routine investigations such as complete blood count, blood urea, serum creatinine, random blood sugar, chest x-ray and ECG were done.

PREMEDICATION

All patients are premedicated with antisialogogue Inj. Glycopyrrolate 10μg/kg intramuscularly half an hour before the procedure. Topical preparation of the nasal cavity by instilling xylometazoline 0.05% drops twice into each nostril was done in both groups. On arrival into the operating room patient's baseline parameters such as heart rate, systolic blood pressure, diastolic blood pressure and mean arterial blood pressure and Spo2 are recorded. Patient monitored with pulse oximetry, NIBP and ECG. I.V Line secured with 18 G venflon cannula.

Inj. Midazolam 0.02mg/kg and Inj. Fentanyl 2μg/kg was given to both the groups.

Patient preoxygenated with 100 % oxygen for 3 minutes.

INDUCTION

Patient induced with Inj. Propofol 2mg/kg in both the groups, Group ML and Group KL

MUSCLE RELAXANT

Inj. Vecuronium 0.1 mg/kg is the muscle relaxant used in both the groups. Patient ventilated for 120 seconds.

INTUBATION

The appropriate endotracheal tube for the age of the patient is chosen and introduced into the most patent nostril till it lies in the oropharynx.

GROUP ML: Patient was positioned in sniffing position and with Macintosh laryngoscope with the aid of Magill's forceps the tube is guided into the glottis and intubation is achieved.

GROUP KL: Patient was positioned with head in neutral position and with King vision Laryngoscope using non channelled blade, after obtaining adequate view of the larynx the cuff of the endotracheal tube is inflated with air and the tube tip is guided to the glottis opening. Then the tube is deflated and advanced further into the trachea to achieve intubation.

A maximum of 60 seconds were allowed with the assigned laryngoscope. If failed to intubate the patient in first attempt, additional manoeuvres such as external laryngeal manipulation, head flexion or 180 degrees rotation of the tube was employed to aid in intubation and were noted. Any intubation not successful even after the use of additional manoeuvres or intubation requiring more than 60 seconds were considered as failure and excluded from the study.

OBSERVATIONS

Primary Objective: To compare

Intubation difficulty score

The intubation difficulty scoring is the sum of the following seven variables

N1: Number of attempts at intubation >1

N2: Number of operators > 1

N3: Number of additional techniques used

N4: Glottic exposure (Cormack Lehane grade minus 1)

N5: Amount of Lifting force required during laryngoscopy (0 = normal ; 1 = increased)

N6: status of the vocal cords , abducted = 0. Adducted = 1

Total IDS = sum of scores

IDS Degree of difficulty

0 Easy

0<IDS<5 Slight difficulty

IDS >5 Moderate to major difficulty

IDS= infinity Impossible25

INTUBATION STRESS RESPONSE

Cardiovascular data (HR, MBP, ECG, and SPO2) were recorded before induction (baseline), at the time of induction, and at 3 minute and at 5 minute thereafter.

SUCCESSFUL PLACEMENT OF ENDOTRACHEAL TUBE:

The Successful nasotracheal placement of the endotracheal tube with the respective laryngoscope was Measured.

COMPLICATIONS

We noted if there are any complications like upper airway injury, cuff perforation, hypoxia.

SECONDARY OBJECTIVES

Modified Cormack Lehane grading

Grade 1: Full view of glottis

Grade 2: Partial view of glottis

a: partial view of the glottis

b: only the arytenoids and epiglottis seen

Grade 3: Only epiglottis seen

a: epiglottis liftable

b: epiglottis not liftable

Grade 4: No glottic structures seen

TIME TAKEN FOR LARYNGOSCOPY

Group ML:

The time taken from when the Macintosh laryngoscope enters the mouth until the best view of the larynx is achieved.

Group KL:

The time taken from when the King Vision video laryngoscope enters the mouth until the best view of the larynx is achieved.

TIME TAKEN FOR INTUBATION

The time taken from insertion of the endotracheal tube through the nose until evidence of the presence of carbon dioxide in the breath xhaled is observed after intubation.

Figure 15: Introduction of tube through the nose Figure 16: cuff inflation of tube to align it with the glottis

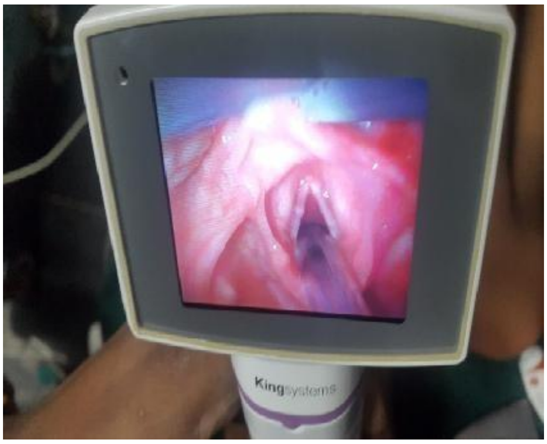
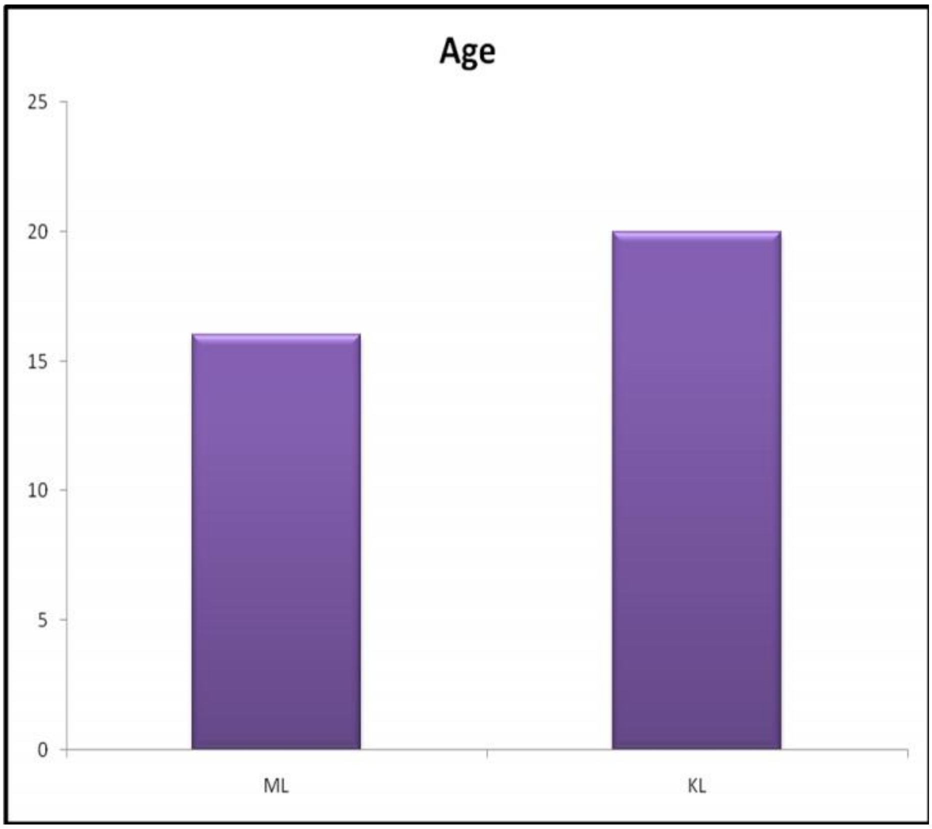


Figure 17: Deflation of cuff **Figure 18 : Introduction of tube in to the glottis**

OBSERVATION AND RESULTS

The collected data had been analysed statistically. The statistical analysis had been done using IBM.SPSS statistics software 23.0 Version. To enumerate about the data descriptive statistics frequency & percentage have been used for categorical variables and to enumerate continuous variable mean & S.D have been used . To find the statistically significant difference between the two samples in Independent groups the Unpaired sample t-test had been used. To know the significance in categorical data Fisher's Exact and Chi-Square test had been used. In the above mentioned statistical tools the probability value of less than .05 is considered as significant difference between the groups.

Figure 19 : Bar diagram indicating the mean age between the two groups.



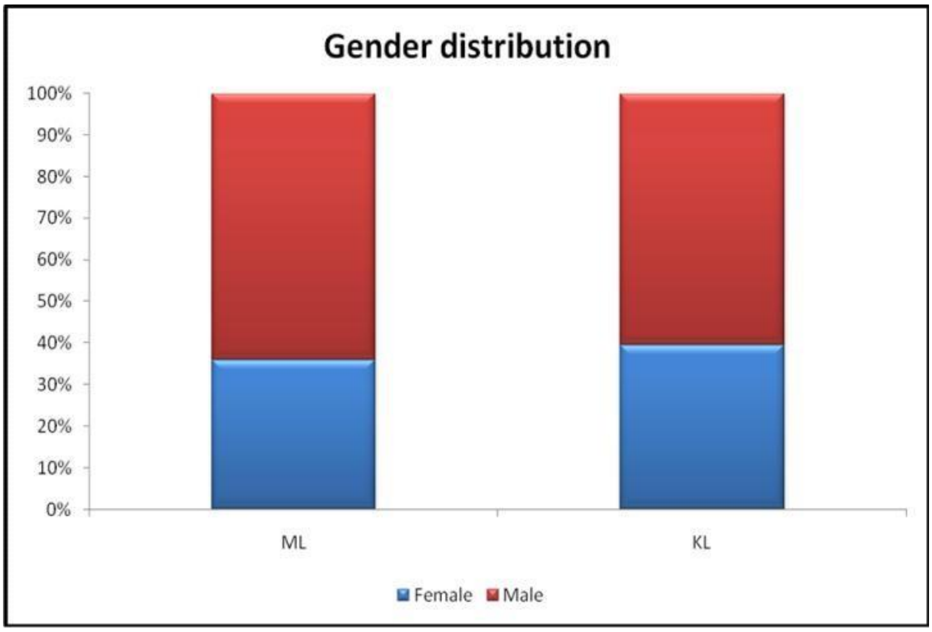
The average age of the patients in Group ML is 16.38 years and Group KL is 19.97 years.

On statistically analysing the mean age, p value was 0.127 hence statistically insignificant. Thus the two groups are comparable with regard to age distribution among the groups.

Table 1: Table indicating the gender distribution between the groups.

			Groups		Total
			ML	KL	
GENDER	F	Count	14	15	29
		% within Groups	35.9%	39.5%	37.7%
	M	Count	25	23	48
		% within Groups	64.1%	60.5%	62.3%
Total		Count	39	38	77
		% within Groups	100.0%	100.0%	100.0%

Figure 20: Bar diagram indicating the gender distribution between the groups



The percentage of Males and Females in Group ML are 64.1 % and 35.9% respectively.

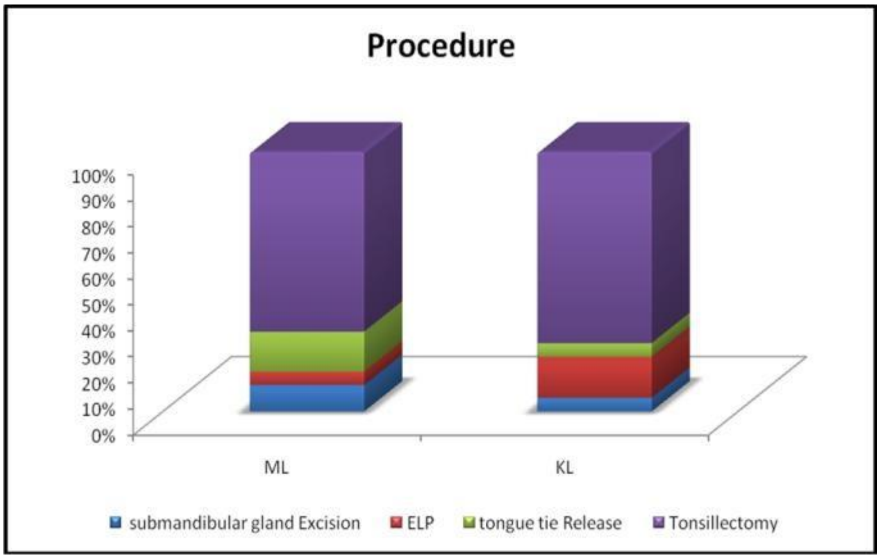
The percentage of Males and Females in Group KL are 60.5% and 39.5 % respectively.

On statistical analysis of the data using Chi-square test the p value is 0.746. Since p value is more than 0.05 and is statistically insignificant, the two groups in terms of gender distribution are comparable.

Table 2. Table indicating the distribution of the procedures the patients underwent.

			Groups		Total
			ML	KL	
Procedure	submandibular gland excision	Count	4	2	6
		% within Groups	10.3%	5.3%	7.8%
	expansion lateral pharyngoplasty	Count	2	6	8
		% within Groups	5.1%	15.8%	10.4%
	tongue tie release	Count	6	2	8
		% within Groups	15.4%	5.3%	10.4%
	tonsillectomy	Count	27	28	55
		% within Groups	69.2%	73.7%	71.4%
Total		Count	39	38	77
		% within Groups	100.0%	100.0%	100.0%

Figure 21: Bar diagram indicating the distribution of the procedure the patients underwent between the two groups



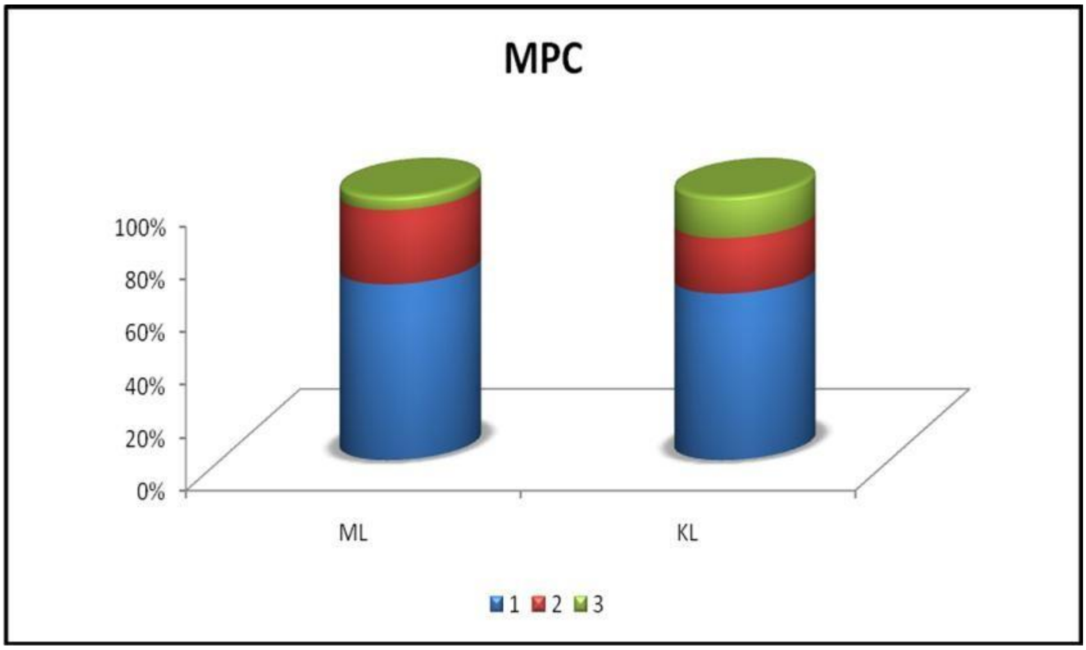
In Group ML, 10.3% patients underwent submandibular gland excision, 5.1% patients underwent expansion lateral pharyngoplasty, 15.4% patients underwent tongue tie release and 69.2% patients underwent tonsillectomy.

In Group KL, 5.3% patients underwent submandibular gland excision, 15.8 % patients underwent expansion lateral pharyngoplasty, 5.3% patients underwent tongue tie release and 73.7% patients underwent tonsillectomy. After analysing the collected data, the p value was 0.197 hence statistically insignificant and the two groups were comparable in terms of the type of procedure for which Nasotracheal intubation was performed.

Table 3. Table indicating the Mallampatti class between the two groups.

			Groups		
			ML	KL	Total
MPC	1	Count	26	24	50
		% within Groups	66.7%	63.2%	64.9%
	2	Count	11	8	19
		% within Groups	28.2%	21.1%	24.7%
	3	Count	2	6	8
		% within Groups	5.1%	15.8%	10.4%
Total		Count	39	38	77
		% within Groups	100.0%	100.0%	100.0%

Figure 22: Bar diagram indicating the Mallampatti class in the two groups.



In Group ML, patients with Mallampatti class 1 are 66.7%, Mallampatti class 2 are 28.2% and Mallampatti class 3 are 5.1%.

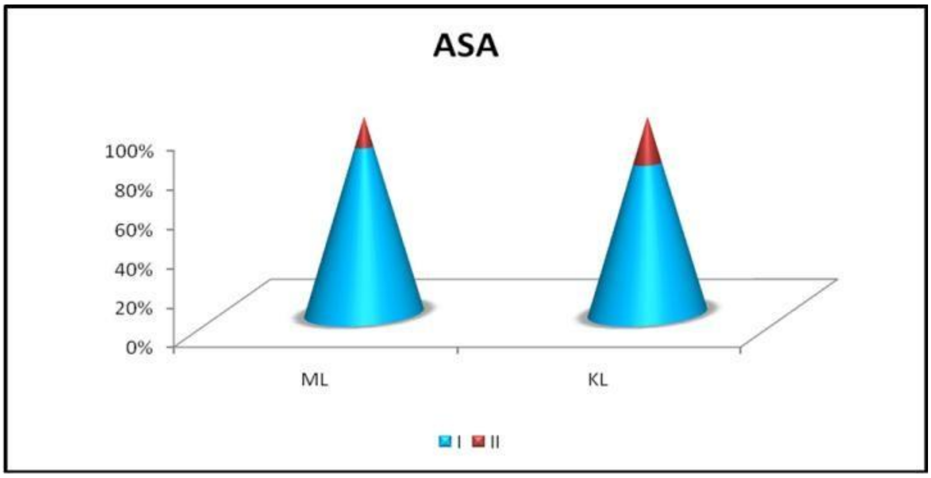
In Group KL, patients with Mallampatti class 1 are 63.2%, Mallampatti class 2 are 21.1% and Mallampatti class 3 are 15.8%.

On statistically analysing the data, the p value is 0.281 using chi-square tests. Since the p value is more than 0.05 it is statistically insignificant and hence the two groups are comparable in terms of preoperative Mallampatti class assessment.

TABLE 4. Table denoting ASA physical status distribution between the two groups.

`			Groups		Total
			ML	KL	
ASA	1	Count	33	29	62
		% within Groups	84.6%	76.3%	80.5%
	2	Count	6	9	15
		% within Groups	15.4%	23.7%	19.5%
Total		Count	39	38	77
		% within Groups	100.0%	100.0%	100.0%

Figure 23: Cone diagram denoting ASA Physical status distribution between the two groups



In group ML, patients with ASA PS I are 84.6% and PS II are 15.4% respectively.

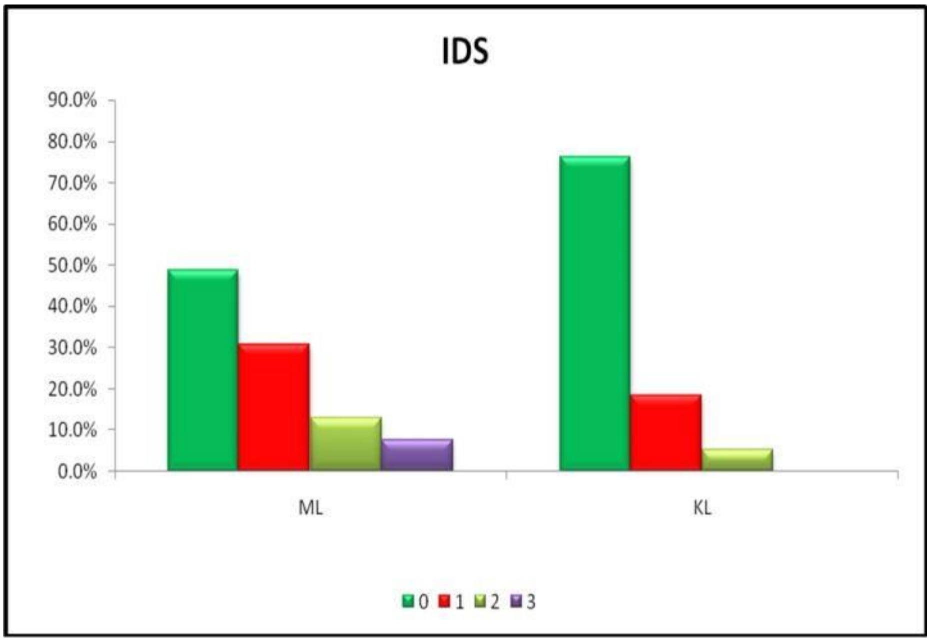
In group KL, patients with ASA PS I are 76.3% and PS II are 23.7% respectively.

On statistically analysing the data using chi-square test, p value is 0.358 and it is statistically insignificant. Hence, the two groups with regard to American society of Anaesthesiology physical status classification are comparable.

Table 5. Table denoting the Intubation difficulty scoring distribution between the two groups.

			Groups		Total
			ML	KL	
IDS	0	Count	19	29	48
		% within Groups	48.7%	76.3%	6233.0%
	1	Count	12	7	19
		% within Groups	30.8%	18.4%	24.6%
	2	Count	5	2	6
		% within Groups	12.8%	5.2%	7.8%
	3	Count	3	0	3
		% within Groups	7.7%	0.0%	3.9%
Total		Count	39	38	77
		% within Groups	100.0%	100.0%	100.0%

Figure 24: Bar diagram denoting the distribution of Intubation difficulty scoring between the two groups.



In group ML , patients with IDS of 0 are 48.7% , IDS of 1 are 30.8%, IDS of 2 are 12.8%, IDS of 3 are 7.7% respectively.

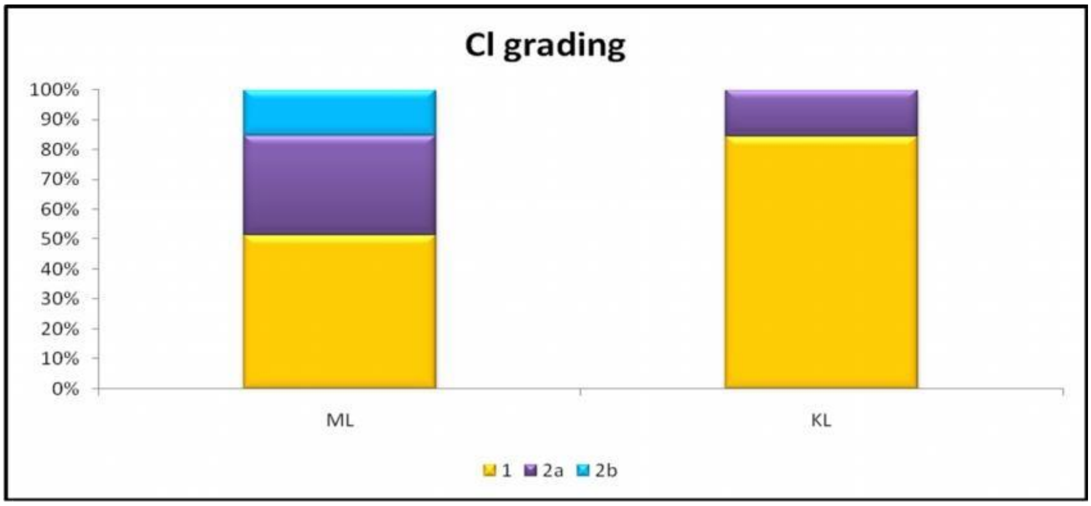
In group KL, patients with IDS of 0 are 76.3%, IDS of 1 are 18.4%, IDS of 2 are 5.2% and IDS of 3 are 0.0% respectively.

On statiscally analysing the data , the p value is 0.0987 , hence statistically insignificant. Thus the two groups with regard to Intubation difficulty scoring are comparable.

Table 6. Table indicating modified Cormack Lehane grading distribution between the two groups.

			Groups		
			ML	**KL**	**Total**
CLGRADE	1.	Count	20	32	52
		% within Groups	51.3%	84.2%	67.5%
	2a	Count	13	6	19
		% within Groups	33.3%	15.8%	24.7%
	2b	Count	6	0	6
		% within Groups	15.4%	0.0%	7.8%
Total		Count	39	38	77
		% within Groups	100.0%	100.0%	100.0%

Figure 25: Bar diagram representing the modified Cormack lehane grade distribution between the groups.

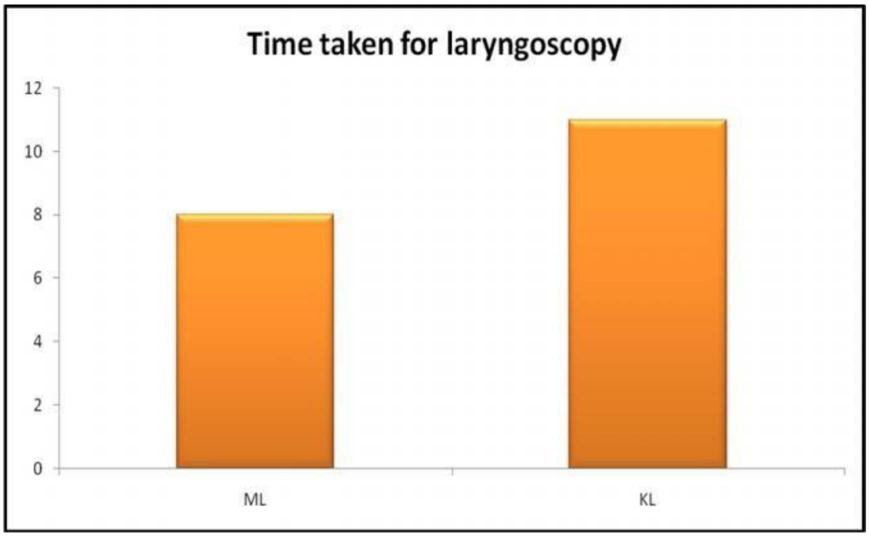


In group ML, patients with CL grade 1 are 51.3%, CL grade 2a are 33.3 % and CL grade 2b are 15.4% respectively.

In group KL, patients with CL grade 1 ar 84.2% , CL grade 2a are 15.8% and CL grade 2b are 0.0% respectively.

On statistically analysing the data, by chi square test p value is 0.011 hence, statistically significant. The Cormack lehane grade in group KL is superior to group ML.

Figure 26: Diagram representing the mean time taken for laryngoscopy between the two groups.

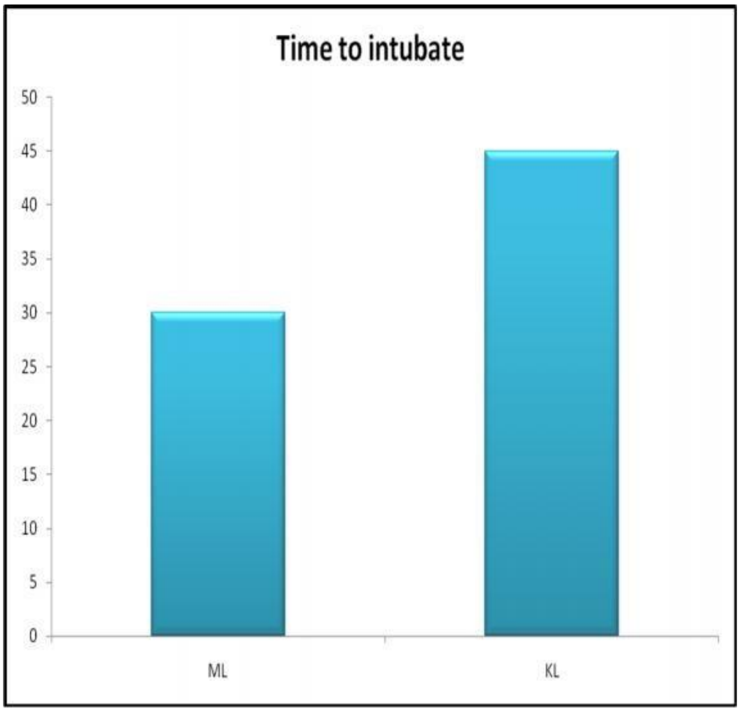


In group ML , the mean time taken for laryngoscopy is 7.82 seconds .

In group KL, the mean time taken for laryngoscopy is 11.33 seconds.

On statistically analysing the data, p value is 0.001 hence statistically significant.

Figure 27: Diagram representing the mean time taking for intubation.



In group ML, the mean time taken for intubation is 29.84 seconds.

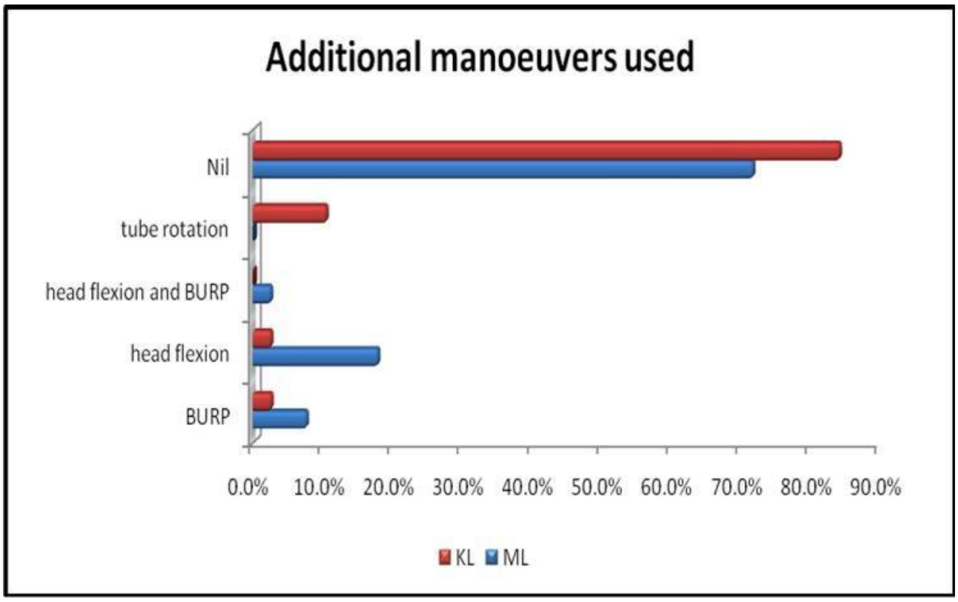
In group KL, the mean time taken for intubation is 44.65 seconds.

On statistically analysing the data, p value is 0.000 hence statistically significant.

Table 7. Table denoting the number of additional manoeuvres used to aid in intubation.

			Groups		
			ML	KL	Total
Additional manoeuvers used	BURP	Count	3	1	4
		% within Groups	7.7%	2.6%	5.2%
	head flexion	Count	7	1	10
		% within Groups	17.9%	2.6%	13.0%
	head flexion and BURP	Count	1	0	1
		% within Groups	2.6%	0.0%	1.3%
	Nil	Count	28	32	58
		% within Groups	71.8%	84.2%	75.3%
	tube rotation	Count	0	4	4
		% within Groups	0.0%	10.5%	5.2%
Total		Count	39	38	77
		% within Groups	100.0%	100.0%	100.0%

Figure 28: Diagram representing the distribution of additional manoeuvers used to aid in intubation



In group ML, 28 patients required no manoeuvers (71.8%) ,3 patients required BURP (7.7%), 7 patients required head flexion (17.9%) , 1 patient required both head flexion and BURP and 0 patients required tube rotation (0.0%) to aid in intubation among the 39 patients.

In group KL, 32 patients required no manoeuvres (84.2%), 1 patient required BURP (2.6%), 1 patients head flexion(2.6%) , 0 patients head flexion and BURP (0.0%)and 4 patients required tube rotation(10.5%) to aid in intubation among the 38 patients.

On analysing the data, p value is 0.105 hence statistically insignificant.

Figure 29: Diagram showing the mean heart rate at baseline, intubation , at 3 and 5 minutes after intubation.

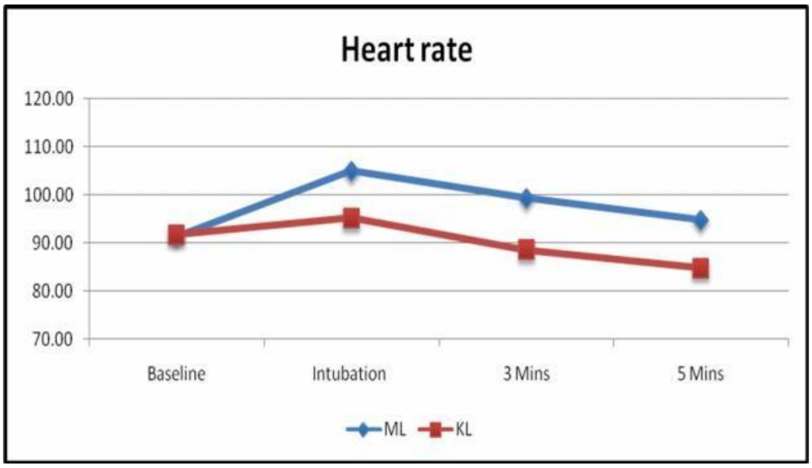
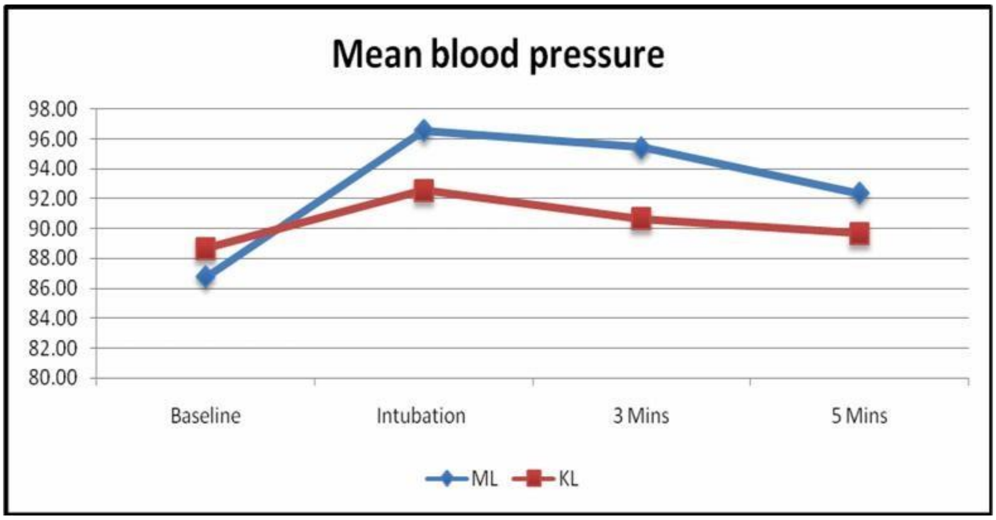


Figure 30: Diagram representing mean blood pressure values at baseline , intubation, 3 mins and 5 minutes post intubation.



In group ML, mean heart rate at baseline , intubation , 3 minutes and 5 minutes post intubation are 91.46, 104.95, 99.33 & 94.77 respectively.

In group KL, mean heart rate at baseline, intubation, 3 minutes and 5 minutes post intubation are 91.76, 95.18, 88.61 & 84.79 respectively.

In group ML, mean of mean blood pressure values at baseline, intubation, 3 minutes and 5 minutes post intubation are 86.77, 96.54, 95.43 and 92.34 respectively.

In group KL, mean of mean blood pressure values at baseline, intubation, 3 minutes and 5 minutes post intubation are 88.65, 92.54, 90.63 and 89.66 respectively.

On statistically analysing the data, p value for heart rate distribution is 0.00 and p value for mean blood pressure distribution is

0.00. Hence it is statistically significant

SUCCESSFUL PLACEMENT OF NASOTRACHEAL TUBE

In group ML, 97% patients were successfully intubated nasotracheally.

In group KL, 95 % patients were successfully intubated nasotracheally.

On statistical analysis, p value is 0.556 hence not significant.

COMPLICATIONS

2 patients had airway trauma in Macintosh group. No patients had airway trauma in King vision group. No patients had cuff perforation or hypoxia in both the groups.

The p value was 0.452 and insignificant.

DISCUSSION

Macintosh laryngoscopes still remain the most widely used laryngoscope in anaesthesiology although different types of videolaryngoscopes with different specifications and characteristics have been evolved. But the current trend is more towards the use of videolaryngoscopes as they provide a superior glottis view when compared to direct laryngoscope and their use in difficult airway scenarios have time again proven very beneficial.

Nasotracheal intubation becomes very important in oral and maxillofacial surgeries as the airway is shared between the anaesthetist and the surgeon. The conventional use of direct laryngoscope with magill's forceps to guide the tube requires adequate laryngoscopy to be performed with instrumentation which can cause airway trauma and in some cases cuff perforation. The use of videolaryngoscope such has King Vision Videolaryngoscope provide a superior view of the larynx and the use of cuff inflation technique leads to intubation without the need for any instrumentation at all.

In our study, we conducted a prospective Randomised Comparative Study between King vision video Laryngoscope and conventional Direct Macintosh Laryngoscope for Nasotracheal intubation.

AGE AS A VARIABLE

Age group between 10-50 years were enrolled in the study, in order to maintain uniformity between the study groups.

GENDER AS A VARIABLE

In the current study, patients of both the genders were enrolled and the parameters were observed so that the result could be projected to the entire general population. The male : female ratio was 6:4 in both the groups and hence the two groups were comparable in terms of gender distribution.

MALLAMPATTI CLASSIFICATION AS A VARIABLE

In our study, we enrolled the patients with Mallampatti class of 1, 2 and 3. Mallampatti class 4 was excluded from the study as our study was conducted only in anticipated normal airways and could not be compared with anticipated difficult airways. If included They might show a varied response and standardization of the groups could not have been done. In group ML, the number of patients with MPC 1, 2 and 3 are 67%, 28% AND 5% respectively. In group KL, the number of patients with MPC 1, 2 and 3 are 63%, 22% and 15% respectively. Thus, the two groups were comparable.

AMERICAN SOCIETY OF ANAESTHESIOLOGY PHYSICAL STATUS AS A VARIABLE

Patients with ASA 1 and 2 were included in the study .Patients with uncontrolled hypertension, Diabetes, Cardiovascular illness, Thyroid disorder were excluded from the study.

Thus we conclude in our study, that with demographic characteristics and preoperative airway assessment as a tool, no significant differences were noted in both the groups with regard to age, gender, Mallampatti class and American society of anaesthesiologist physical status. Hence the two groups were comparable.

COMPARISON OF INTUBATION DIFFICULTY SCORE BETWEEN THE GROUPS

In the current study, from the observations Intubation difficulty score is observed to have no statistical significance in between the two groups that were compared.

In the group ML, grade 0 is seen in 48.7% cases and score 1 in 30.8% and score 2 in 12.8% and score 3 in 7.7%.

King vision laryngoscope group 76.3% cases were score 0, 18.4% were score 1, 5.2% were score 2 .

In ML group, there was one case of failed intubation, and In KL group, there were 2 cases of failed intubation, and these cases were considered as failure and intubated using conventional Macintosh laryngoscope orally and excluded from study.

In both the groups, the cause for failed endotracheal intubation was inability and difficulty in placing the endotracheal tube into the glottis. In Macintosh group, 3 patients required backward upward rightward pressure, 7 patients required head flexion and 1 patient required both BURP and head flexion to achieve Nasotracheal intubation. In king vision group, 4 patients required tube rotation , 1 patient required BURP and 1 patient required head flexion to achieve intubation With King vision laryngoscope, the tube requires rotational movement to align it with the glottis rather than backward upward rightward pressure or head flexion to align the tube into the glottis. With Macintosh laryngoscope backward upward rightward pressure or head flexion or both were required rather than tube rotation to aid in intubation.

Swapnil M. Khadake et al[25] in his study also observed that using King vision laryngoscope with cuff inflation technique is a good alternative to Macintosh laryngoscope with Magill's forceps for Nasotracheal intubation.

N. Gupta et al[26] in his study also concluded that Nasotracheal intubation using Glidescope videolaryngoscope using cuff inflation technique can be considered as an alternative to blind Nasotracheal intubation. He also demonstrated that by rotation of the tube it aids in intubation while using videolaryngoscope.

Vinuta V Patil et al[27] demonstrated that The overall intubating conditions of CMAC® VL was better than direct Macintosh laryngoscope for NTI with respect to view of glottis, intubation time and the need for additional manoeuvres.

Fu S. Xue, MD et al[33] From his study also concluded that Cuff inflation technique is useful aid in improving success of Nasotracheal intubation with airtraq videolaryngoscope.

H.k Baddoo and B.J Phillips et al[35] From their study concluded that C-MAC videolaryngoscope can be a useful tool for Nasotracheal intubation with the aid of cuff inflation technique.

The use of king vision laryngoscope with cuff inflation technique can be a alternative to Macintosh laryngoscope with Magill's forceps guided Nasotracheal intubation with the advantage of better glottic view with King vision laryngoscope.

COMPARING HAEMODYNAMIC STRESS RESPONSE TO INTUBATION BETWEEN THE TWO GROUPS

In our study we observed a statistically significant higher heart rate and mean blood pressure in group ML when compared to group KL while at intubation and 3 and 5 minutes post intubation.

Sherif M. Elhadi et al[34] also observed less hemodynamic stress response with King vision laryngoscope than when compared to Macintosh laryngoscope.

Manuel Ángel Gómez-Ríos et al[32] conducted his study on mannequins and observed that lesser force on the airway and lesser audible dental clicks were not with indirect laryngoscope when compared to direct laryngoscope.

Vinuta V Patil et al[27] also in his study observed lesser hemodynamic stress response with CMAC Videolaryngoscope than with Macintosh laryngoscope for Nasotracheal intubations.

Swapnil M. Khadake et al[25] also demonstrated lesser hemodynamic stress response with king vision with cuff inflation technique guided Nasotracheal intubation when compared with Macintosh with Magill’s forceps.

Videolaryngoscopes require lesser force to be applied to the upper airway and do not require the epiglottis to be lifted hence reduce the hemodynamic stress response associated with Direct Macintosh laryngoscope.

SUCCESSFUL PLACEMENT OF ENDOTRACHEAL TUBE:

In our study, there was 97.5% successful Nasotracheal intubation with conventional direct Macintosh laryngoscope using Magill's forceps and with King Vision laryngoscope using cuff inflation technique there was 95% successful placement of nasotracheal tube.

The failed intubations with were intubated successfully with direct Macintosh laryngoscope orally and considered as failure.

In Group KL the failure was because the blade requires to be positioned at an appropriate distance from the glottis to achieve adequate view of the glottis and to avoid misalignment with the tube and also rotational movements of the tube to align it with the glottis is required to achieve intubation. Adequate volume of cuff needs to be inflated to bring the tip of the tube to the glottis inlet inadequate volume leads to failed intubation.

In group ML, airway instrumentation with Magill's forceps leads to airway trauma and injury leading to bleeding and obscuring the view for intubation. Macintosh laryngoscopes require the head to be extended and neck to be flexed to achieve adequate view of the glottis; this position leads to inability to guide the Nasotracheal tube while using Magill's forceps into the trachea.

COMPLICATIONS

Complications such as airway trauma were noted in 2 patients in group ML. No cuff perforation or hypoxia was noted in both the groups.

The airway trauma is due to airway instrumentation using Magill's forceps such that the delicate mucosa of the oral cavity bleeds on the lightest touch.

CORMACK LEHANE GRADING BETWEEN THE GROUPS

From our study, the observations noted are

In group ML, out of 39 patients 20 patients had CL grade 1 and 13 patients had CL grade 2a and 6 patients had CL grade 2b. It is noted that the glottis view is statistically significantly better with group KL in which out of 39 patients, 32 had CL grade 1 and 6 patients had CL grade 2a and no patients had CL grade 2b. The optical principle in King Vision laryngoscope and the indirect view of the glottis obtained through the camera located at the distal tip in King vision laryngoscope provides an improved laryngeal view.

Manuel Ángel Gómez-Ríos et al[32] has found similar results in his study that Airtraq and McGrath videolaryngoscopes provide better glottis view when compared to direct Macintosh laryngoscope.

Sherif M. Elhadi et al[34] also observed in his study a better glottis view using King vision laryngoscope in comparison with Macintosh laryngoscope.

Fu S. Xue MD et al[33] also concluded in his study that the Cormack Lehane grade in Airtraq videolaryngoscope was superior to Macintosh laryngoscope.

King vision videolaryngoscope with provides better glottis view as indirect view of the glottis is obtained on the screen through a camera placed on the tip of the blade rather than direct sightline view of the glottis obtained while .using Macintosh laryngoscope

COMPARING OF TIME TAKEN FOR LARYNGOSCOPY IN THE TWO GROUPS

In our study we noted that there is statistically significant difference in the time taken for laryngoscopy between the two groups.

In group KL, the mean time taken for laryngoscopy was 11.33 seconds, which was more than the mean time taken for laryngoscopy in group ML which is 7.8 seconds.

Akihisa Y et al[36] also concluded in his study that the time taken for laryngoscopy with King Vision laryngoscope was more than Macintosh laryngoscope.

Sherif M. Elhadi et al[34] observed no difference in the time taken for laryngoscopy between King vision laryngoscope and Macintosh laryngoscope.

Manuel Ángel Gómez-Ríos et al[32] demonstrated lesser time for laryngoscopy with McGrath and Airtraq laryngoscope when compared with Macintosh laryngoscope.

The main reason for an increased time of laryngoscopy with King Vision laryngoscope in our study is due better experience and performance of the anaesthetist with Macintosh laryngoscope than with King vision laryngoscope.

COMPARING THE TIME TAKEN FOR INTUBATION IN THE GROUPS

In our study we observed that there is statistically significant difference in the time taken for intubation between the two groups.

In Group KL, the mean time taken to intubate was 44.65 seconds, Comparatively more duration as in Group ML which is 29.84 seconds.

Akihisa Y et al[36] also demonstrated in his study that intubation time using King vision laryngoscope was more than with Macintosh laryngoscope.

Vinuta V Patil et al [27] observed in their study that Nasotracheal intubation using CMAC VL required lesser intubation time when compared with Macintosh laryngoscope.

Sherif M. Elhadi et al[34] observed in his study that there was no difference in between the intubation times between King vision laryngoscope and Macintosh laryngoscope.

Manuel Ángel Gómez-Ríos et al[32] also demonstrated that lesser time for intubation while using McGrath and Airtraq videolaryngoscope when compared to Macintosh laryngoscope.

The main limitation of this study was that, anaesthetist performing the Nasotracheal intubation was not blinded to the study groups and hence possibility of bias existed. The main reason for increased time for intubation with King vision laryngoscope is due to unfamiliarity and lesser experience with the device and cuff inflation technique when compared to Macintosh laryngoscope and Magill's forceps.

CONCLUSION

The purpose of our study was to determine the efficiency of King Vision videolaryngoscope with cuff inflation technique for Nasotracheal intubation.

King vision laryngoscope had better laryngeal view in terms of Cormack Lehane grading and lesser hemodynamic stress response. The time taken to intubate nasotracheally was prolonged with King Vision laryngoscope with cuff inflation technique when compared with conventional direct Macintosh laryngoscope with Magill's forceps Hence from my study I conclude that Nasotracheal intubation with King vision video laryngoscopes using cuff inflation technique is a good alternative to conventional direct Macintosh laryngoscope using Magill's forceps in terms of providing better laryngeal view , lesser hemodynamic response and lesser complications.

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PATIENT CONSENT FORM

STUDY TITLE

Randomised Comparative Study between King vision video Laryngoscope and conventional Direct Macintosh Laryngoscope for Nasotracheal intubation.

Study centre: Government Stanley Medical College and Hospital, Chennai

Participant name: Age: Sex:

I confirm that I have understood the purpose of the procedure for the above study. I had the opportunity to ask questions and all my questions and doubts have been answered to my satisfaction.

I have been explained about the pitfall in the procedure. I have been explained about the safety, advantage and disadvantage of the technique. I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason.

I understand that investigator, regulatory authorities and the ethics committee will not need my permission to look at my health record both in respect to current study and any further research that may be conducted in relation to it, even if I withdraw from the study. I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from the study.

I understand that I will be intubated nasally with either Macintosh direct laryngoscope using Magill's forceps or with king Vision laryngoscope using cuff inflation technique.I consent to undergo this procedure.

Date: signature/thumb impression of the patient

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PORFORMA

NAME: AGE/SEX: IP NO.:

DATE: Wt.: GROUP:

DIAGNOSIS:

SURGERY:

BRIEF HISTORY:

COEXISTING ILLNESS:

EXAMINATION:

PR: CVS:

BP: RS:

INVESTIGATIONS:

Hb: BLOOD UREA: SUGAR: Sr. CREATININE:

ANESTHESIA DETAILS:

AIRWAY : MPC I / MPC II

DENTITION

NECK

SPINE

ASSESSMENT: ASA I / ASA II

PREMEDICATION:

INDUCTION:

PARAMETERS OBSERVED:

INTUBATION DIFFICULTY SCORING

IDS SCORE	DEGREE OF DIFFICULTY	OBSERVATION
0	EASY	
0-5	SLIGHTLY DIFFICULT	
>5	MODERATE TO MAJOR DIFFICULTY	
INFINITY	IMPOSSIBLE	

CORMACK LEHANE GRADING

GRADE 1	FULL VIEW OF GLOTTIS	OBSERVATION
GRADE 2 A B	PARTIAL VIEW OF GLOTTIS ONLY THE ARYTENOIDS AND EPIGLOTTIS SEEN	
GRADE 3 A B	ONLY EPIGLOTTIS SEEN EPIGLOTTIS LIFTABLE EPIGLOTTIS NOT LIFTTABLE	
GRADE 4	NEITHER EPIGLOTTIS NOR GLOTTIS SEEN	

INTUBATION STRESS RESPONSE

	HEART RATE	MBP
BASAL		
INDUCTION		
3MIN		
5MIN		

COMPLICATIONS

AIRWAY INJURY	
CUFF PERFORATION	
HYPOXIA	

SUCCESSFUL PLACEMENT OF ENDOTRACHEAL TUBE: YES /NO

TIME TAKEN FOR LARYNGOSCOPY:

TIME TAKEN FOR INTUBATION: